The role of digitalisation in climate action

How cities can deliver smart and sustainable communities

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Where smart meets sustainable

Each city has its own unique mix of challenges and opportunities but one issue shared by all local governments is the global climate crisis.

Cities are at the forefront of both the impacts of climate change and taking action to address it – they are home to more than half of the world's population and responsible for about 70 percent of global greenhouse gas emissions.

The other major transformation taking place in cities around the world is the digitalisation of services and the greater use of data in decision-making.

The opportunity to bring climate action and digitalisation together for maximum impact is highlighted in the European Union's '100 Climate-Neutral and Smart Cities by 2030' mission.

Patrick Child, Mission Manager for the EU's Climate-Neutral and Smart Cities Mission, says the programme was titled in this way "as a recognition that we are not going to achieve the objectives that we have in terms of decarbonisation and the climate unless we can employ smart solutions."

"There's a major digital dimension to more or less everything that we're doing, whether it's the energy sector or mobility solutions or even the way that we employ digital techniques in the circular management of building materials," he says. "Everywhere you look, there is always going to be a necessary digital smart dimension to the policies

that we need to implement and need to implement rapidly to achieve our goals."

According to analyst predictions, CO_2e emissions saved by smart city deployments in Europe are forecast to reach 247 million metric tons (MMT) by 2028, from 161 MMT in 2023, representing growth of 53 percent.

This encompasses solutions across all areas of city operations including buildings, transport, energy and water.

Cities also acknowledge a growing role for digitalisation but they are clear that it is no silver bullet for such a complex and urgent issue and that challenges remain.

"There is an understanding of technology being a factor in becoming a climate-neutral city. It's not the be all and end all, but it's certainly a factor in it," says Christian Gaarde Nielsen, Team Leader at Copenhagen Solutions Lab.

Many city leaders agree that smart cities and climate neutrality teams do need to work together and there is major potential in using data and digital tools to make systems more efficient, enable people to make sustainable choices and boost the circular economy. Several are seeing benefits already but say there is still work to be done to more closely integrate climate and digital strategies.

And as Iina Oilinki, Project Director in Helsinki's Climate Unit, puts it: "We don't want to chain ourselves to a certain methodology. Digitalisation in itself isn't an answer – it has to be used when it's the best way to do something."

"We are not going to achieve the objectives that we have in terms of decarbonisation and the climate unless we can employ smart solutions."

Patrick Child, Mission Manager for the European Union's Climate-Neutral and Smart Cities Mission.

This report explores how digital transformation and climate action intersect and spotlights case studies – with a particular focus on Nordic cities and other leading examples from elsewhere in Europe and beyond. It includes:

- The role of data, and the emerging role of AI and digital twins in climate action.
- Innovation districts, pilots and scaling success.
- Addressing the carbon footprint of digitalisation and AI.
- Organisational and strategic alignment to ensure climate and digitalisation efforts work in tandem for maximum results.

A growing role for data

Data has a key role in helping to reduce emissions, from accurately tracking and sharing progress to underpinning smart management of energy, traffic and buildings.

It's still an area of untapped potential, though. Research in November 2022 that surveyed 200 city leaders globally found that while the biggest challenge for cities is climate change, cited by 94 percent of urban leaders, only 20 percent said they were making good progress with using data for environment and sustainability initiatives.

A similar trend applied to major areas of emissions, with only 34 percent saying they're making good or very good progress with using data in the mobility domain and 32 percent in energy and other utilities.

Helsinki doubles down on data

Helsinki's climate approach has evolved from being overseen by the city's environmental department to being under a dedicated Climate Unit.

The previous target for reaching carbon neutrality by 2035 incorporated 147 actions and 280 indicators to track progress. Under the new unit, the target has been brought forward to 2030 and the strategy streamlined to focus on outcomes.

"Only about five percent of the actions were actually cutting emissions," says Iina Oilinki, Project Director of Helsinki's Climate Unit.

"All the actions that are part of the new plan have to create enough impact on emissions and all those actions that are selected for the plan are based on data."

Some of the latest measures include implementing demand-controlled ventilation in city offices, using low-emission concrete in infrastructure projects, replacing outdoor lighting sources with LEDs, and developing regional heating solutions.

Transport is also a priority as emissions targets were not being met with existing actions.

The small climate team does much of the data analysis in-house and uses consultants when requirements are more complex.

While the previous carbon-neutral Helsinki programme was evaluated and updated once every four years, this will now be done annually as part of the budget process, reflecting an emerging trend in cities around the world.

Patrick Child, Mission Manager for the EU's Climate-Neutral and Smart Cities Mission, notes that one initiative under the Mission is to develop "genuinely comparable metrics for climate neutrality between the different cities" because there are variations in how this is calculated.

Creating the foundations in Reykjavik

In Reykjavik, Iceland, Chief Data Officer Inga Rós Gunnarsdóttir sees greater potential to use data to meet the city's carbon neutrality goals.

The six priorities of the climate plan are: a walkable city; energy exchange; health-enhancing commutes; circular thinking; green structures; and carbon sequestration. The plan supports Reykjavik's Green Plan, the overall strategy for 2030 covering the environment, economy and society.

"Our role is to support the green plan by providing smart solutions and solutions for the citizens so they won't have to seek services from outside their home, but they can just apply for services through their phone," Gunnarsdóttir says.

As well as digitising services, Gunnarsdóttir's team is also working on projects such as digital maps to promote the city's walkability goals – to help people find their nearest waste facility, election site, or playground on foot, for example.

More fundamentally, the foundations are being built for more ambitious projects in the future.

"My department is only around three years old," says Gunnarsdóttir. "Our main project right now is to build up the data environment and set the data structures and governance so we can be more prepared to receive data from other institutions and also be able to [ingest] live stream data – about traffic, for example."

This work will also pave the way for departments to more easily build their own dashboards and carry out analyses.

"We can make better decisions based on newer and more reliable data," says Gunnarsdóttir. "We can move quicker if we see that some of our climate goals are slipping, analyse why and respond to that."

An energy management first in Copenhagen

Copenhagen aims to reduce energy consumption in city-owned buildings by 40 percent by 2025, compared to 2010.

The Danish capital has a building portfolio covering 2.2 million m^2, and almost all these buildings are connected to a digital Energy Monitoring System (EMS) that the city began developing in 2015. This system monitors heat, electricity and water consumption on an hourly basis to support continuous improvement.

All relevant personnel in the municipality have access to the energy monitoring system and they can track energy consumption in buildings and portfolios of buildings, such as schools.

"The system supports data for the different layers in the decision-making system. We must provide data and visualise data for the technician working in the basement right up to the mayor," says Anders Christian Lyngtorp, Head of the Technical Unit in the Copenhagen City Properties department.

He adds: "We can actually show what works when it comes to energy savings, and it is also the same data that is necessary for any accounting when it comes to a climate action plan."

The city is also close to finalising the upgrade of its Building Management Systems (BMS) in municipal buildings.

Technical standards and procurement policies have been a focus to ensure the building management systems are interoperable and integrate into shared platforms.

"This means we can actually also give others access to the buildings' control systems and then we can start talking about artificial intelligence and controlling of buildings together with the rest of the system," says Lyngtorp.

The energy monitoring system has cut energy consumption by four percent and the building management system has cut energy consumption by 14 percent.

"If we have systems that can operate by themselves and use power only when it's needed, then you can move towards climate neutrality."

Christian Gaarde Nielsen, Team Leader at Copenhagen's Solutions Lab

The next stage is moving to flexible electricity and heat consumption where consumption in the city's buildings can be scaled up or down based on demand and renewable energy availability. When renewable energy is scarce, the city could identify the systems that could be turned down without compromising the comfort and safety of inhabitants and use the energy in other areas where need is greater. Two pilot projects have already taken place and are being implemented at a small scale in 2023. This follows an implementation project that sought to identify the business cases for flexible energy technologies for heating and electricity.

Collaboration between Copenhagen City Properties and Copenhagen Solutions Lab (Copenhagen's incubator for smart city initiatives) has helped test the flexible energy solutions that are now being implemented.

Nielsen says: "If we have systems that can operate by themselves and use energy only when it's needed, then you can move further towards climate neutrality as continuous actions are being taken automatically at the best possible time, not just when someone has the time to do adjustments."

Building the data ecosystem

Other cities are also preparing the groundwork to use data more effectively to tackle pressing challenges such as climate change, and to enable more stakeholders to collaborate.

London in the UK is replacing its Datastore open data platform with a new Data for London hub that will act as a 'central library catalogue' for data held by both the public and private sector.

Rather than ingesting ever-more data and hoping someone finds it useful, the focus with Data for London is on sourcing data based on needs and linking to where it is held. In addition, as London tackles issues such as air quality, it needs to be able to use various types of sensor and real-time data, which the Datastore wasn't built for when it launched in 2010.

London's Chief Digital Officer Theo Blackwell also sees a key role for cities to become "market makers" and use data to create new business models for climate investments in technology such as solar panels, heat pumps and district energy systems.

Blackwell gives the example of a housing estate or neighbourhood that wants to install solar panels. "The city acts as the vehicle for a procurement of that nature and negotiates all of the legal consents, and so takes in a sense the risk of that investment away. Private investment comes into the neighbourhood and puts in solar panels or other required green infrastructure and the saving to the customer and the investment return to the company is worked out."

This, he said, supports deals to retrofit neighbourhoods at scale. "It makes it more investment-friendly for long-term business propositions to be put into place."

"That's a really exciting potential," says Blackwell. "But it's only going to happen if we use data."

Takeaways

- **Data can support transparency on climate actions and progress**
- **Data can help to improve efficiency in traffic, energy and buildings, which are all major sources of emissions**
- **Data can also help to inform climate spending – both for cities and private investors**
- **Building technical foundations and governance policies now is key to enabling new insights, partnerships and models**

Technology advances – AI and digital twins

Emerging and advancing tools in the climate toolbox are artificial intelligence (AI) and digital twins.

Annual sales revenue for AI focused on city sustainability is forecast to grow from US$693.3 million in 2023 to US$6.5 billion by 2032. AI's ability to process large amounts of data from diverse sources can make it a useful tool in tackling thorny problems that have many intersecting elements.

Tampere turns to AI

Tampere in Finland has a Data-driven city for citizens programme with a pillar dedicated to sustainability and a Carbon Neutral Tampere 2030 roadmap.

"They do interact closely because a lot of the data that we are gathering and knowledge about how to use the data that we are thinking about in this data-driven programme goes hand in hand with the climate neutrality programme," says Teppo Rantanen, Tampere's Executive Director of Innovation.

Illustration 277697479 | Ai Digital Twin © Yuriy Nedopekin | Dreamstime.com

Matias Ansaharju, Development Manager for Urban Development and Infrastructure services, which houses the climate initiative, serves as a key link between programmes and departments.

"At the corporate level, the climate actions and the digitalisation should be and are intertwined," he says. "We have been speaking about the smart and sustainable city a lot because these are the two major transformations that are going to happen."

The city sees a growing role for AI in climate action, for instance.

"We have a lot of data about emissions and the use of energy but it's really laborious to analyse it and develop insights to make decisions," says Ansaharju.

Tampere is working on a 'Cloud for Sustainability' pilot project with Microsoft, including testing a generative AI solution. Rantanen says he expects AI to bring benefits in areas such as energy efficiency and mobility, including helping the city be more predictive and using data to help people make more sustainable choices.

He adds that today, emissions are calculated based on models.

"What if we could actually measure some of that and use sensors to show us the real outcome? That is something we are just starting to talk about and we have some companies that are interested in bringing that technology."

AI helps reduce food emissions in Aarhus

Several projects that incorporate AI are delivering results on sustainability in Denmark's second biggest city.

Line Gerstrand, Smart City Coordinator for the City of Aarhus, says climate-neutral and smart cities do need to work together but that "in Denmark, we're not always good at combining the two agendas."

Aarhus has a separate strategy for smart cities and for climate neutrality and they're not integrated yet but the city's next climate strategy will include technology as a more dominant theme.

An AI-based fleet optimiser tool, which analysed driving patterns based on GPS data, enabled the city to cut the number of cars in its home care fleet by 30 percent.

The city also reduced CO_2 from food purchases by 12 percent with 'intelligent climate accounting', corresponding to around 275 tons of CO_2.

"Everything that the city buys is measured on CO_2 and that's changing our buying habits and tenders," says Gerstrand. An AI system calculates the emissions.

Aarhus has introduced internal climate fees on selected foods in order to incentivise climate-friendly purchases by municipal departments. When buying meat such as beef, for example, a 'shadow fee' is automatically added on top through the city's procurement system. Purchasing of beef by the city has been reduced by 40 percent.

Challenges that have been identified with AI for cities include procurement policies which are sometimes out of step with new pricing models such as 'as a service' and volume-based charges.

Transparency is key when using AI and machine learning, and cities including Helsinki and Amsterdam have launched AI and algorithm registers to show how data is being used.

Digital twins

Another emerging technology for city sustainability is digital twins. Analysts expect at least 500 urban digital twins to be deployed by 2025.

Common in the engineering and manufacturing sectors, digital twins are increasingly being adopted by cities for a variety of use cases, including reducing emissions from buildings, traffic management, economic development and climate action planning and monitoring.

They can represent streets, buildings, trees, fire hydrants and other assets, and use both live and historical data to enable cities to project how change will affect the urban environment and how assets are performing in real time.

Helsingborg in Sweden, for example, is testing a digital twin as part of its climate-related work.

The tool shows the City of Helsingborg's emission statistics and projected emissions if no measures are taken. It also shows how emissions could be reduced with different measures.

Helsingborg has used the digital twin in work that is underway to develop a new climate and energy plan.

"By highlighting the needs that exist in the city in terms of, among other things, energy consumption and mobility and opportunities for movement and transport, we can clarify different ways in which we can meet these needs," says Milou Mandolin, environmental strategist in the City of Helsingborg.

Helsinki's Energy and Climate Atlas is based on 3D models of the city and contains information about renewable energy and possibilities for energy renovations throughout the Helsinki region. It incorporates energy data on buildings including, buildings' simulated heating demand and solar and geothermal potential.

"With more and more data, we can help find the answers to the questions people have," says Mikko Rusama, who until recently was Helsinki's Chief Digital Officer.

The tool can be used by city planners, housing companies, residents, and companies offering energy solutions.

Potential challenges for cities include lack of knowledge of digital twins and their applications among municipal staff, which could limit uses and return on investment. There are also challenges surrounding insufficiently digitised municipal data and ensuring that data from a wide array of Internet of Things (IoT) devices owned by varying departments is made available for digital twin use.

Takeaways

- **AI offers cities the opportunity to make sense of large amounts of data and become more predictive**
- **Digital twins can help cities road test climate policies and initiatives before committing**
- **Data governance is key to making both tools a success**

Resident engagement

Engaging residents with climate action is also a key part of the process. Residents need to understand how they can participate and have access to clear and transparent information about action and progress.

"When you think about climate change, the city can do its part but the consumers and the citizens are actually the ones who can really change the path," says Matias Ansaharju from Tampere.

Tampere is developing an app for citizens that will recognise how people are travelling – for example, by car, cycling or on public transport, and count the overall emissions of the trip. Residents will earn rewards for greener choices.

"It's a gamification feature. We want to make it fun and beneficial for citizens to make sustainable choices," says Ansaharju.

The Data Buffet is open

In Reykjavik, Gunnarsdóttir's team recently launched an open data portal called the 'Data Buffet', which is focused on providing data to residents in a "simple but lively" way.

It includes a wide range of information, from swimming pools to demographic details,

including data stories which provide context and the ability to drill down into raw datasets.

Oskar Sandholt, the City of Reykjavik's Director of Service and Innovation, says: "Visual storytelling is an effective way to present complex information by combining text, images, and statistics. This approach makes the data more accessible and engaging for the reader, leading to a better understanding of the subject.

"Since our brains process about 90 percent of information in a graphic form, visual information plays a crucial role in comprehension. Additionally, humans have a natural inclination towards narratives, making it easier to relate to and absorb information presented in this format."

The portal already includes some sustainability indicators such as greenhouse gas emissions, use of renewable and non-renewable energy, and the transport modal split.

Hronn Hrafnsdottir, Head of Reykjavik's Climate Change Unit, says this is an advance as previously residents were provided with information via posters in public spaces but it was often general and based on older figures.

Copenhagen opens up innovation

Following on from the success of the energy monitoring system internally, Copenhagen has begun working with large private building-owners in the city through an 'energy hub' networking group. As a result, many private building-owners are now focused on energy management as part of their corporate social responsibility.

"We have shown them how to use our energy monitoring system, how to be open about energy consumption for the attendants, how they can actually tell the story about their own management of assets," says Anders Christian Lyngtorp from the City of Copenhagen.

He says other cities in the Nordics are now taking a similar approach.

Interactive feedback

In a new approach, some cities such as Dundee and Nottingham in the UK and elsewhere have begun experimenting with interactive signage around the city, where residents can use their mobiles to 'chat' with infrastructure about climate action and the city's strategy, and to give their feedback.

Takeaways

- **Engaging residents can build trust and encourage sustainable behaviour**
- **Providing visuals and narrative around data helps people make sense of complex information**
- **In-situ interaction can help bring information to life for residents and enable them to have input**

Scaling innovation

Innovation districts are becoming an important tool in the drive for net-zero emissions cities.

Helsingborg's HEIDI innovation district in Oceanhamnen aims to provide a physical place that brings together the municipality, start-ups, scale-ups, researchers and residents.

It is being launched by the City of Helsingborg, Region Skåne, Lund University and major stakeholders from the business community.

Claes Malmberg, Senior Business Development Officer, City of Helsingborg, says: "Innovation is key to sustainable growth. The world faces big challenges with climate change and declining resources.

"We believe we can achieve climate neutrality by 2030 and increase quality of life for all citizens with the help of innovation. HEIDI makes it easy for all these actors to meet and collaborate together."

The district will provide access to networks and supporting organisations as well as access to the City of Helsingborg "as an innovation partner" through testbeds.

Particular areas of focus are technology and data-driven innovation including AI and machine learning; smart city projects for social innovation; energy, water and waste; mobility; and e-commerce and logistics.

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To drive solutions that meet strategic goals, the city will set climate and sustainability-related challenges and put them out to the wider innovation community.

Malmberg says collaboration around funding is also a key aspect of the innovation district.

"We know that financing is always critical," he comments. "And this EU Mission [climate-neutral and smart cities by 2030] is actually a source to huge financing. We need to be smarter, we need to involve researchers, we need to involve business as we can't do it by ourselves."

Scaling success

Tampere aims for its Hiedanranta district to be 'CO_2 negative' and produce more than it consumes. The former factory area will be turned into a neighbourhood for 25,000 residents.

Its themes include sustainable transport and logistics, smart and sustainable energy, the circular economy, and green and blue infrastructure.

Executive Director of Innovation, Teppo Rantanen says Tampere's approach more broadly is to operate as a "platform for innovation and development".

"We are open for new innovations and ideas and we like to have a 'fail fast' approach where we love to test things and see if it works. If it doesn't, we move on. That's why we've opened up our platforms for different types of innovations to be able to do tests like this."

"We believe we can achieve climate neutrality by 2030 and increase quality of life for all citizens with the help of innovation. HEIDI makes it easy for all these actors to meet and collaborate together."

Claes Malmberg, Senior Business Development Officer, City of Helsingborg.

Line Gerstrand, Smart City Coordinator for the City of Aarhus, says scaling has been one of the biggest challenges with smart cities and it's a priority in the Danish municipality.

"When we have a new project that actually works, it's documented and we try to use that technology and all the governance around it and change behaviour and create mechanisms to be able to spread that to other departments that can make use of it."

Finding a balance

Some climate teams said while there is a role for innovation and piloting, they prefer to adopt solutions once they are more proven.

Iina Oilinki in Helsinki's climate unit says: "We try to not do pilots. We have a certain logic in how the climate plan is done, because we only have seven years left, so everything has to be very big impact. Over 50 percent of all the actions that we do have to have a direct reduction in emissions, then the next category is things that enable emissions reduction, such as building bike lanes.

"Only a tiny percent can be in piloting and research because we found out that takes too long."

When the climate unit does run pilots, they focus on specific areas which at the moment include reducing materials in building construction while maintaining safety, and reducing heat in buildings for older residents in an energy-efficient manner.

Helsinki's innovation company Forum Virium does run various pilot projects related to energy, mobility, health and more.

"I firmly believe the innovation company is helping us to identify new areas where we have potential and it's important to understand that these kinds of pilot may not automatically produce big impact," says Mikko Rusama, former Chief Digital Officer in Helsinki.

"The most important objective we have been trying to achieve is to make sure that when these pilots and deployments are done, the learnings are shared, and in some cases, we scale up the pilot if we see huge potential."

Based on one project, Forum Virium produced a guide for housing companies on using sensor data to reduce energy use, for instance.

"Forum Virium is very actively engaging with residents in the city and also companies, and like with any innovation activity, it's sometimes very difficult to measure the direct impact, and the results from the innovation work often come with a delay."

The Forum Virium board includes representatives from city divisions, as well as from the city-owned energy company Helen.

"That is a way to create links to make sure that the lessons learned and knowledge are spread," says Rusama.

Takeaways

- **Open innovation challenges set by the city focus people on city priorities.**
- **Having a 'fail fast and learn' culture can encourage innovation in the city and with start-ups.**
- **Documenting success and establishing processes helps to scale technology beyond one department and use case.**
- **For climate efforts, there is a balance to be struck between innovation and proven solutions that exist today. Experimenting for the future with a long-term view is also key.**

Sustainable IT

There is a growing recognition that digitalisation and data have the potential to address major societal issues but can also have serious environmental implications, particularly as artificial intelligence advances.

Estimates vary but suggest that the ICT sector accounts for approximately seven percent of global electricity consumption and this is forecast to rise to at least 13 percent by 2030. This energy footprint currently represents three to five percent of global carbon emissions, putting it on a par with the aviation sector.

This is an emerging area of concern for cities.

Christian Gaarde Nielsen from Copenhagen Solutions Lab says: "We don't have the whole scope of AI and blockchain, how much energy they use and how that comes into play but it's something we are increasingly being asked about in projects. It is therefore something we will try to get a better understanding of going forward, to understand how it impacts the overall goal of climate neutrality."

Copenhagen's forthcoming new climate plan will likely require that everything that is procured or consumed by the municipality will need to have a carbon emissions calculation. If so, this aspect will be implemented by the municipal procurement team.

Line Gerstrand, Smart City Coordinator for the City of Aarhus, agrees that it's a concern. Earlier this year, the city co-hosted a conference focused

on sustainable IT and coding for more climate-friendly IT solutions.

"It's definitely on the agenda that it is not just digitalisation in itself, but IT should be sustainable as well."

Singapore's Government Technology agency has introduced a Sustainability Framework to help meet Singapore's goal to achieve net-zero emissions in the public sector by 2045 and nationally by 2050.

The framework incorporates three pillars. Sustainable organisation includes making sustainability part of business decisions and optimising operations with data. Sustainable ICT focuses on the supply chain, equipment and devices, cloud and data centres, and software and data. The third pillar, digital innovation for sustainability, is about using technology such as intelligent monitoring, automated resource optimisation and digital twins to meet environmental goals.

Henry Chang, Deputy Chief Executive at GovTech, said "sustainable digitalisation" calls for a whole ecosystem effort, including architects, software engineers, infrastructure, data scientists, procurement, and end users.

GovTech is also working towards reducing the carbon footprint of cloud infrastructure in the Government Commercial Cloud, encouraging government data centres to meet Singapore's environmental standards, and optimising code reuse for cloud projects.

"GovTech will explore increasing the containerisation of applications and usage of microservices to further automate and streamline the application development process in FY24," a statement said.

In a new tender for staff computers and printers, which are replaced around every three years, the agency said it would incorporate sustainability criteria for the first time, requiring suppliers to comply with environmental and energy standards, and demonstrate packaging and materials reuse. This will constitute five percent of the tender evaluation.

Takeaways

- **Since computing consumes large amounts of energy, this is becoming an increasingly important consideration for cities**
- **This is also one of the drivers for a move from traditional data centres to cloud infrastructure**
- **Sustainability requirements can be included in procurement criteria for products, although it is early days for digital tools and services**

A culture of collaboration

Most cities interviewed for this report agreed that it is important for digitalisation and climate action teams to work together.

In a minority of cities, climate and digitalisation leads had distinct roles that rarely met and in others, collaborative work between the two teams was a product of personal efforts to 'cross the hall' so more work needs to be done to drive this collaboration.

Several best practices emerged:

- Political commitment from the top is key in order to drive both collaboration and progress. This includes goal-setting from the mayor and ongoing oversight by the city council.
- Climate themes need to be embedded into all city operations.
- Climate and digitalisation efforts should be strategically aligned.
- While climate teams can set the agenda, digitalisation leaders are key links with experts in departments to help them find solutions, succeed with implementation, and scale results elsewhere.
- Cross-department working groups help to ensure ongoing alignment and knowledge-sharing.

- Data infrastructure and cross-city governance policies are required to ensure cities can innovate with data to address the climate crisis and other complex challenges.
- Emerging practices also include climate budgeting, pioneered in Oslo. This approach integrates climate considerations into all city decisions across departments. The climate budget outlines the targets and measures to cut CO_2 emissions as well as costs, lines of responsibility and how much emissions will be reduced. Departments must report back regularly on progress to ensure goals remain on track.

Deloitte on driving smart, sustainable collaboration in cities

Cities Today talks to Lauri Byckling, Nordic Public Sector Industry Leader at Deloitte, about the intersection between digitalisation and climate action.

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How do you digitalisation and climate action teams working together?

Many smart solutions directly link into more efficient use of energy and resources, which contributes to climate neutrality. For example, with smart solutions in buildings, you can achieve 30 to 40 percent energy and water savings

Transport, energy production and waste management also play a significant part in achieving carbon neutrality. A lot of these activities happen in cities, and cities typically have a big role in how they are conducted.

You need to have and understand the data in order to measure and reduce the carbon footprint in a city.

How can advances in data support cities' climate action in new ways?

Data can support transparency on climate actions and also help attract private investment into cities.

It's about reporting not only financial data, but all kinds of key performance indicators that are in place to show the progress that is being made.

Cities are also increasingly using data to 'climate proof' public spending – for example, using data to assess climate risks and evaluate spending on long-term investments.

Understanding citizens' and travellers' patterns to increase the efficiency of public transportation is another illustration of the power of data.

AI and digital twins also present many opportunities, such as in energy management of buildings, traffic control, transport and logistics planning.

I think digital twins are going to be a big thing for cities – particularly to plan and test significant investments before making them. Lots of cities are building whole new areas for people to live in and digital twins could have significant benefits here.

Innovation districts are a growing trend. Are there best practices you would pinpoint?

Innovation districts are a great way to come up with practical solutions, showcase the city and cooperate with the private sector.

Scaling after limited pilots is still often a challenge. We see that innovative procurement approaches

Scaling after limited pilots is still often a challenge. We see that innovative procurement approaches are increasingly being used – such as open innovation challenges – but there's a lot more opportunity to procure solutions differently.

Lauri Byckling, Nordic Public Sector Industry Leader at Deloitte

are increasingly being used – such as open innovation challenges – but there's a lot more opportunity to procure solutions differently.

The other thing is to start with the end in mind in terms of piloting, so when you start a pilot, do it in a way that makes it as easy as possible to expand to other areas.

Things can move more slowly in the public sector but it's important to remember that 2030 is not an end goal; we need to do things after that as well and the earlier we start, the sooner we will find solutions.

The carbon footprint of data, AI and digital tools is a growing consideration. What strategies are emerging in this area?

Since computing consumes huge amounts of energy, this is becoming increasingly important. It's one of the reasons to move into the cloud from traditional data centres.

Cities can use sustainability as a procurement criteria for digital tools and systems.

What do you think are some key strategies for driving collaboration between digitalisation and climate action?

Political commitment is key to drive both collaboration and progress. Linking the climate and digital transformation responsibilities and programmes on various levels needs a focused effort.

I think it's quite common for cities to work in a siloed way and be department-focused. At the same time, cities understand the need for more collaboration but it's not always so easy to do.

Incorporating climate goals and actions in digital transformation programmes and vice versa is important, as is ensuring city council support and oversight. In addition, embedding climate themes into different departments instead of separating them into central offices can help drive results.

Once you get everybody to buy in to the idea that you need to include the climate goals in everything you do, it starts to happen naturally. What can be beneficial is central support to understand how to best do that.

It's also important that the experts meet and talk to each other as part of their work, even forming joint project teams and cross-city working groups.

Learning from other cities and organisations and utilising outside expertise is key. At Deloitte, we see how many cities are approaching similar challenges and can share those good practices.

Finally, the intersection of digitalisation and climate action is also about saving taxpayer money – reducing the use of energy, improving the efficiency of assets, and attracting private investment.

There are multiple positive reasons why this collaboration is important.

Lauri specialises in strategic transformations, leadership development, digitalisation and ICT-enabled business tranvsformation. He has 20 years of experience from strategic development programmes of major cities.

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