

Smart Sustainable Districts (SSD)

Summary

Smart Sustainable Districts is a group of pioneering city districts working together to deploy and accelerate the knowledge, expertise and best practice needed to transition to zero-carbon living and build resilience into Europe's cities. A smart sustainable district is characterised by low carbon mobility, smart grids, energy neutral buildings, efficient water management and accessible, public green space, all underpinned by responsive technologies that optimise resources. A smart sustainable district also promotes wellbeing and sustainable lifestyles, and facilitates new ways of working, commuting, consuming, interacting and enjoying the city. Smart Sustainable Districts is one of Climate-KIC's flagship programmes.

Key Points

- The onus is on cities to build resilience, mitigate environmental impact and reduce resource use in the face of climate change
- The district scale is the optimum size for testing and implementing innovation – large enough to gauge positive impact, yet small enough to achieve change
- A lack of joined-up policy and implementation frameworks are holding back the wider uptake of district developments
- The SSD network offers support and services to create the dialogue, test the beneficial impact and help realise sustainable, district-led development
- As of 2016, Climate-KIC's SSD programme comprises nine districts across Europe and is expanding globally

Background to Smart Sustainable Districts and Programme Drivers

Cities are where 75 percent of the global population will live by 2050. In the face of climate change, as major users of resources, and producers of municipal waste and greenhouse gases, the onus is on cities to mitigate their environmental impact and build resilience. Globally, cities have committed to ambitious climate and energy reduction goals, but most are struggling to bridge the gap between the rhetoric of aspiration and the practical steps that lead to measureable impact.

Districts are the most effective unit of scale at which to test integrated systems and infrastructure, and accelerate sustainability. Districts are compact enough to concentrate resources and improve efficiency, are autonomous, yet they are large enough to have noticeable impact.

Integrating projects and systems that conventionally operate separately such as building functions, energy or mobility can enhance environmental performance and help meet ambitious performance goals. Such technologies and systems – district heating, smart grids, demand management and resource sharing – already exist but a lack of joined-up policy and implementation frameworks at the municipal level can be a barrier to widespread adoption. At the district level, it's possible to test out the new models of financing and contracting, joint ventures, partnerships, community engagement or novel governance models that this integration demands.





To be able to build the joined-up policy and implementation frameworks, there must be effective coordination across stakeholders who often have disparate interests. There must be effective data to determine priorities, demonstrate the value and support decision-making, effective schemes and structures to raise the capital required and make propositions attractive to investors. All of this is crucial in helping districts go beyond being a pilot, to replicate and scale up their achievements.

Smart Sustainable Districts – What

Typical district projects and innovations include smart grids, district energy and heating, drainage and water management, rainwater harvesting, green streets, zero waste programs, district composting, waste-to-energy, car sharing, biking and bike lanes, urban agriculture, culture and events, local maps and data interactions. Smart Sustainable District developments are guided by the concept of ‘factor four’ – the idea of leveraging twice the value with half the resources. Goals can include local job creation, boosting local business, improving community participation or inspiring new patterns of citizen behaviour, as much as enhancing environmental performance.

Smart Sustainable Districts – How

While conventional green development strategies tend to be led by master developers or agencies, district developments often demand wider collaboration and input from a diverse range of stakeholders. The Smart Sustainable Districts programme acts to bring together consortiums of policymakers, local municipalities, utilities, private developers, innovation experts, sustainability specialists and citizen groups.

Districts undertake a multi-stage process, firstly, to determine their priorities, strategies and opportunities. From this starting point they work on identifying tangible ‘factor four’ outcomes from achieving cross-sector synergy, either through demonstrating previously unconsidered benefits and values, or through bringing in new data. Smart Sustainable Districts has helped articulate the return on investment for integrated outcomes through realising new models of value in social, economic and environmental terms. This often involves making a more compelling business case through visualisation, modelling complex environmental data interactions and envisaging scenarios. Such ‘win-win’ scenarios often lead to improved sustainable outcomes.



Smart Sustainable Districts Network – Achievements

The last phase of the process is about managing, evaluating and refining the proposition. Districts can collect local data such as greenhouse gas emissions, microclimates, heat islands, wind tunnels, vehicle miles traveled, crowd behaviour, spatial navigation, drainage, storm water quality, energy and utility savings. By integrating and layering such data, by understanding the interactions, sharing best practice and applying new techniques, districts can enhance and refine the emerging developments.

The typical outcomes of Smart Sustainable Districts include frameworks and implementation strategies, implementation tools and processes, methods of assessment, ways to raise capital, and recommendations to help develop the incentives and policies needed to scale up district development. For example, SSD work in Berlin demonstrates how sharing data instruments can bring transparency in multi-level governance and involves citizens in decision-making. In Paris, SSD has facilitated the local community in co-designing their own tools to help monitor construction and development, while SSD in London has advanced the applications of data to the concept of smart park.

Smart Sustainable Districts was established in 2014 as a way of accelerating sustainable district development, and district-led technologies and innovations across Europe. The programme has achieved proof of concept in several districts including Queen Elizabeth Olympic Park, London; Moabit West, Berlin; Utrecht New Centre and Les Docks de Saint-Ouen, Paris. The challenges, methods, tools and implementation frameworks developed are detailed in further case studies.

What's Next?

Smart Sustainable Districts currently has nine districts within its network – Rotterdam's Stadshaven Harbour, Utrecht The New Centre, London's Queen Elizabeth Park, Paris' Les Dock de Saint-Ouen, Gothenburg's Johanneberg, Malmö southeast, Berlin Moabit West, Helsinki's Kalasatama and Copenhagen Energy Block. Over the coming year, Smart Sustainable Districts is looking to expand globally.

Smart Sustainable Districts is currently funded and supported by Climate-KIC, but the long-term ambition is to develop and offer the scoping, assessment, feasibility and framework implementation services, reflecting the commercial value and market opportunities that integrated district developments bring.

Queen Elizabeth Olympic Park – SSD

Summary

Queen Elizabeth Olympic Park (QEOP) is a major urban district development in London regenerating the east end of the UK capital, positioning it as a new social and economic hub. Having hosted the 2012 London Olympic Games, the park is looking to build on its Olympic legacy. It is home to five world-class sporting venues, including the Zaha Hadid London Aquatics Centre and the Copper Box Arena. It is responsible for creating 10,000 new homes, a world-class cultural and education district, and a digital and media business hub. Smart Sustainable Districts (SSD) has helped advance QEOP's work on resource-efficient buildings, energy systems and developing a smart park.

Key Points

- The London Legacy Development Corporation is tasked with rebuilding a local east London economy harnessing the activity of QEOP
- Strategic strands of the development include energy systems, building resource efficiency 'real-time, local data', and innovation in data architecture and management
- Smart energy management systems support a proactive and evidence-based approach to energy conservation of the sporting venues
- Successful tools for citizen engagement emphasise learning, fun and interaction
- Data on crowd behaviour informs the development of interactive park features and displays
- Deployment of an integrated data architecture approach is advancing emerging international standards, setting a benchmark for London and Europe
- Each of these work streams draw on the expertise of Climate-KIC's SSD programme and its partners

Project Background and Drivers

The regeneration of east London has been on the agenda for successive London mayors and British governments. Throughout the 2000s, the Channel Tunnel Rail link, the Westfield Shopping Centre and the formation of Stratford City Olympics and the Paralympics London Legacy Development Corporation have all sought to revive an area suffering deprivation and unemployment as manufacturing, the area's historic economic base, moved offshore.

The London Legacy Development Corporation, formed in the wake of the 2012 London Olympics, has been tasked with enacting a global sporting legacy, and rebuilding a local economy through QEOP. Its aim is to create a thriving sport, tourist and visitor destination, attract high-profile institutions across culture and education, and entice international investment to help secure the future of the area.

At the centre of this development is QEOP. Spanning 45 hectares, it is home to five world-class sporting venues, and a blossoming digital and media business hub, with plans for 10,000 new homes, an international business quarter and a world-class cultural and education district. The major focus for the district is on creating high quality buildings based on inclusive design and high environmental performance, greening and rehabilitating the environment, and evolving with the local community.





The District Plan

As part of the SSD programme, QEOP focuses on strategic strands including energy systems, resource efficiency of the park's buildings and sporting venues, the collection and use of real-time, local data to enhance navigation across the park, as well as user experience and quality of life – all of which are underpinned by innovation in data architecture and management of urban spaces.

Resource efficiency in buildings is a priority across the district, with data modelling centred on the iconic London Aquatics Centre and Copper Box Arena. The aim has been to create tools and approaches to enable low cost, low environmental impact future-ready, non-domestic buildings.

Particularly from an engineering perspective, improvements are ongoing, but for the SSD QEOP team, integrating management and metering systems has been critical. A new energy management system, which tracks remediation, makes recommendations and supports a proactive approach to energy conser-

vation, is being trialled with French energy provider, and Climate-KIC partner, Engie. The SSD QEOP team is also working with the ICRI Lab to pilot domestic smart energy meters in its residential blocks, to help make energy consumption tangible, and promote energy conservation.

SSD has supported the team in managing the district energy network through identifying energy consumption patterns, pinpointing peak heating loads or when capacity is constrained. This helps even out peaks and troughs, according to Jennifer Daothong, head of strategy and sustainability at the London Legacy Development Corporation.

Efficiency of the energy-intensive London Aquatics Centre, with its heated 50m pool, has been addressed by integrating pool pumps and backwash recovery. "Sweating your assets harder helps push back when you need to upgrade the infrastructure capacity," says Daothong. The positive impact and energy savings from buildings can be reintegrated into the network operation.



Smart Park / Future Living

The QEOP team is also exploring how the combination of smart spaces and sustainability can enhance local user experience, boost quality of life, support better wayfinding in the area and facilitate community engagement, according to QEOP IT programme and change manager. "It's not just visitors to the park that we're looking at, we have local residents, workers and employees - we want to connect with all of our park users," says Edmonds.

The park offers free public wifi throughout, allowing visitors to engage in its events and schemes through a park smart phone app, and web and social media platforms. This enables the team to understand how people are using the space and buildings, how they respond to indoor temperatures, and to ascertain how indoor climate control can impact behaviour.

"Connecting with people through the wifi helps us to understand use of the sporting venues, crowd routes and park hotspots. We're also looking at how we might use this data to provide intelligent park lighting and dynamic wayfinding solutions, for example," explains Edmonds.

Feedback through Fun

Getting public feedback on the development is a crucial part of the evolution of the park. While demographics are vital to confirming the involvement and participation of the local community, qualitative data and how people feel about the space is equally as important. The team has developed a number of innovative engagement tools to gather feedback, with an emphasis on interaction and fun.

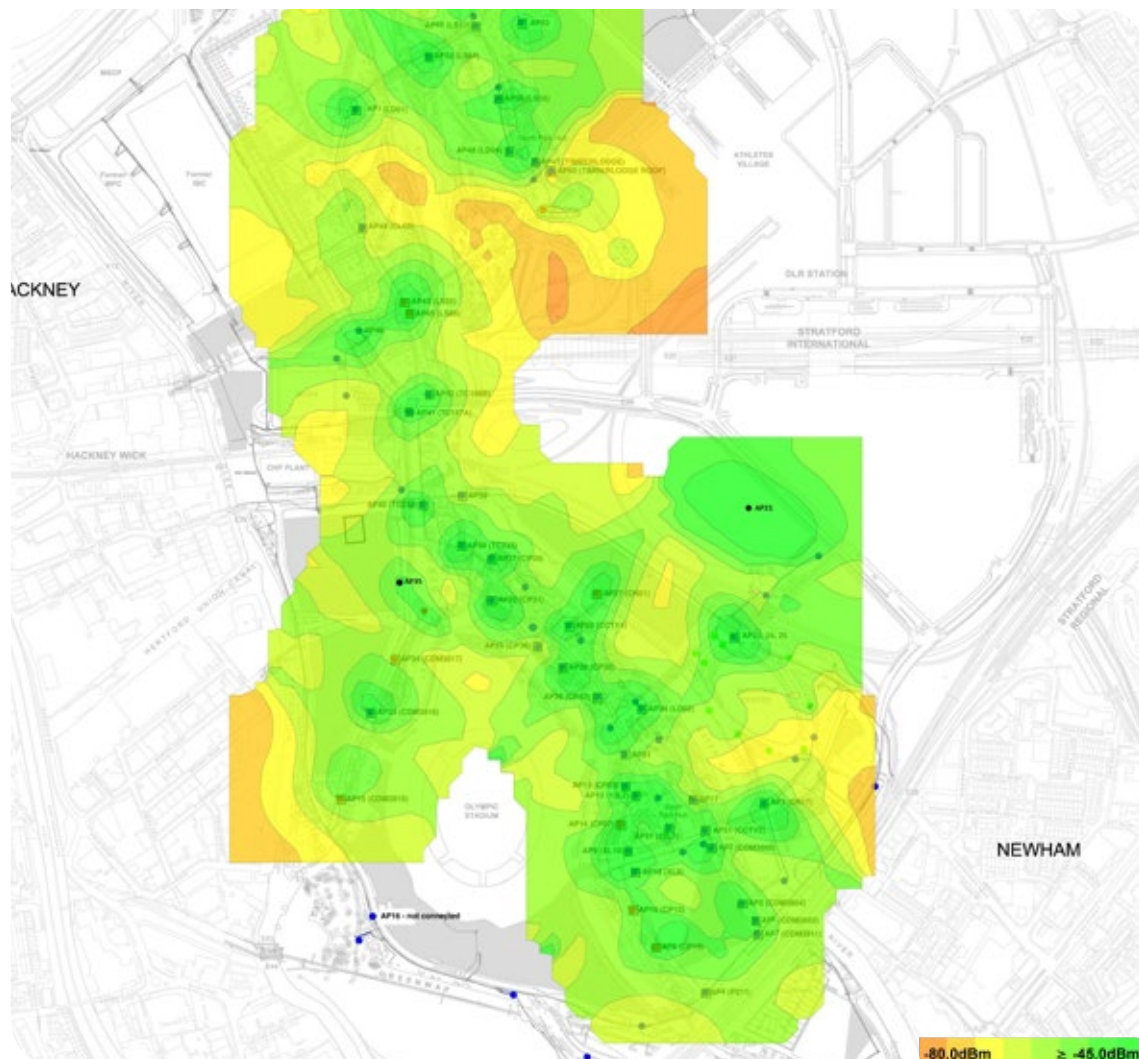
“With a change of governments over the last few years has been successive asking residents what they think of the development. We understand that at this stage, they’re tired of being asked that question, so we have focused on making engagement innovative and fun. And, data and technology can support this,” says Daothong.

The park is trialling smart features that respond to social interaction, such as 3D projections, or a fountain controlled by facial recognition and emotion. The team has successfully piloted a series of tools to engage citizens, including Hello Lamppost, an interactive concept whereby street furniture can engage in conversation; a mobile park robot, developed by University College London and VoxBox, a game questionnaire that can channel visitor responses into the park’s data architecture system to allow comparison between qualitative and quantitative data sets.

Sensors throughout the park, provided by Intel as part of the Capstone project, collect data such as air quality and heat patterns, and provide an actual real-time micro-climatic picture, rather than an extrapolated one based on models from a general London monitoring system. These help pinpoint and track changes stemming from the development, further understanding its environmental impact, according to Edmonds.

Innovation in Data Management

An overarching approach to data architecture and management allows the information stemming from different systems within the development to be integrated. This is a major shift away from standalone, in-house databases, where you might be restricted on the array of data sets you can analyse, according to Edmonds. QEOP is working with leading global researchers and institutions on a cutting edge architectural and management data store project, experimenting with emerging international standards.





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"It's all part of an integrated data store and web services based architecture, that would enable you to compare and correlate many different types of data sets. We're working with [SSD partner] Technical University (TU) Munich on this. They have built proof of concept data architecture, using CityGML" says Edmonds. "This work is a testbed for London too. The Mayor's office and the London Data Store are working with us on our findings."

The Role of Smart Sustainable Districts in QEOP

Each of the work streams in QEOP draws on the expertise of Climate-KIC's Smart Sustainable Districts programme and its partners. SSD has not just opened the doors to a wider network of potential partners, but has enabled QEOP to share innovation concepts with other European districts. Being part of a European-wide district programme has helped it gain wider recognition within London and the UK.

Daothong says: "So many of the themes that run through SSD fit with our ambitions. That's why we wanted to be part of it." Edmonds adds: "If we find that what we're doing here has real value, then we look to SSD to help articulate, qualify and share those successes," he says.

What's Next?

For the QEOP SSD team, 2015 has encompassed designs, concepts and building a framework for the work streams, while 2016 has been about proof of concept and testing. As the team moves into 2017/2018, attention will shift to consolidating this expertise, potentially offering it as a Smart Sustainable District on a commercial service basis. "It's about showing the real benefit for the QEOP and for the public," says Edmonds.

Moabit West, Berlin – SSD

Summary

Moabit West is an inner city district in Berlin, home to both domestic-residential and industrial activity. As part of Climate-KIC's Smart Sustainable Districts programme, the district project is working to take the first steps in implementing The Green Moabit 2013 urban development plan. The development is driven by ambitious sustainability goals for energy efficiency in manufacturing, electric commuter mobility and sustainable water management, with a District Data Atlas and citizen engagement strategy at its core.

Key Points

- There is significant pressure on the Berlin administration to upgrade central urban living spaces without gentrification, particularly in districts, like Moabit, that are located in the heart of the city
- District and city authorities have notable ambitions for sustainability to become climate-neutral by 2050
- SSD Moabit provides an implementation plan and tools to realise the Green Moabit urban development process, based on a related plan adopted in 2014
- Strong stakeholder networks (enterprise network, quarter management network) are core assets for replicating measures and solutions
- SSD Moabit focuses on sustainable water management, energy efficiency and low carbon mobility
- The development will only be a success if it addresses the needs of the people living in the district, and citizen engagement has been crucial
- The team has created a series of data management and visualisation tools to support transparency and citizen engagement including a District Data Atlas
- Multi-level governance, with the Smart Citizen Network Board, has motivated utilities and infrastructure companies to become implementation partners



Project Background and Drivers

Moabit West, part of Moabit island at the heart of Berlin, is a city district area that is both residential and industrial. More than half the area is home to manufacturing, service and logistics firms, while there is a strong migrant population. The project's borders are the contact point for new arrivals, and are a first stop for refugees coming to Berlin.

Like many European cities, there is significant pressure on the Berlin administration to create quality living spaces and affordable housing for a growing Metropolis, particularly in districts, like Moabit, located in the heart of the city. The borough of Mitte, which oversees the administration of Moabit, expects at least 24,000 inhabitants by 2030, and, in 2015, approved planning for almost 4,000 flats. The Senate of Berlin, too, has responded to the increasingly pressured housing market, pledging to create an additional 10,000 units per year.

Against this housing backdrop, the district and city authorities have notable ambitions for a sustainable, resilient and low-carbon future. The main challenge lies in the retrofitting of the building stock that cause high energy and heat demand. Extending low-carbon mobility through schemes such as e-charging stations and the city's first electric bus line are all efforts to become climate-neutral by 2050. The city is looking to reduce its GHG emissions 85 percent through energy supply, buildings, economy, transport, private households and consumption. The vision for Moabit West, nestled in one of the scheme's core development zones, City West, is to be a "core of inner-city growth" with high levels of innovation.

The Green Moabit process, an urban development plan adopted in 2014 by the district municipality, provided a starting point for Smart Sustainable Districts Moabit West. While the plan encompassed an integrated landscape of solutions spanning water, waste, energy, mobility, public space and social infrastructure, it lacked an implementation strategy, and had few resources from local authorities. It needed a neutral partner and a visionary leadership to help realise the plan. Green Moabit, a recognised brand throughout the city, serves as the main source for the opportunities and project formulation with the process driven by the Smart Sustainable Districts management team.



The District Plan

The Smart Sustainable District “Moabit West” has been managed by TU Berlin’s CHORA City & Energy department since September 2014. The department acts as an unbiased and neutral party, liaising between stakeholders, managing and coordinating interests, and facilitating the integration of innovations and technologies. The main areas of focus for SSD Moabit are sustainable water management, energy efficiency and low carbon mobility. In the first phase of the project, the three focus areas were developed separately, before identifying interactions and potential for integration. The cross-cutting urban planning tools, like District Data Atlas and Citizen Engagement integrated all themes right from the beginning and tried to represent the challenges in a holistic way.

Sustainable water management solutions can be applied in many private and public water systems. The main challenge adopted in SSD in Moabit West is related to the industrial properties with sealed surfaces and large roof areas that cause the overflow and flooding of the sewage systems during storms. The rainwater sewage fee that needs to be paid by owners and tenants according to the size of the roof is relatively high in Berlin and puts pressure on fee payers to reconsider their drainage systems.

Smart tree planting concepts are being installed to help store storm water from roads. Collected rainwater will be used for cooling or irrigation.

Although Moabit’s period building stock presents an opportunity to improve energy efficiency, the district’s public lighting, industrial sites and industrial processes were deemed a greater priority in SSD because of their potential for an easier steering by municipalities and the enterprise network. This work focuses on understanding the factors that support or hinder efforts to improve energy efficiency through auditing of local businesses and scenario development (simulations) of public street conditions.

“This is an area that struggles with investment from the private sector, even though it’s proven that changing to energy efficient technologies, processes or upgrading buildings can be financially worthwhile,” says Nadine Kuhla von Bergmann, district key account manager for Moabit. “We’re focusing on the decision taking processes. With SMEs, the owner isn’t usually running production processes or sitting in the building. That’s a huge discrepancy. We’re doing three audits, looking for incentives, evaluations and looking to the district level to see where there might be cross benefits between stakeholders.”



The SSD team is also examining the potential of e-mobility, low-emission transport and innovative transport technology for local private and commercial travel. The aim here is to use Moabit to test out options for commuters, local businesses and residents, and estimate the impact of different strategies on emissions. Most recently, with the support of the SSD network, Moabit has secured its first bike-sharing scheme partner, nextbike. This will enable the first bike stations of a non-motorised shared transport system to be piloted in Moabit West in 2017.

Engaging the Local Community

The SSD Moabit team works on the principle that the development will only be a success if it addresses the needs of the people living in the district. Engaging the local community has been crucial. It has created a series of tools that supports citizen network engagement, such as crowd-mapping of projects and transport demands.

The outcomes have influenced decisions taken on infrastructure measures, such as the bike station location. A seminar "Citizen City Science" developed instruments for smartphones and social media, and designed intervention for public spaces to encourage dialogue driven by cultural interest.

Scenario games are used to negotiate between different interests during development, and led to the definition of "low hanging fruits" for the implementation strategy of SSD. They were also used for creating a shared future vision among stakeholders with different backgrounds and to overcome sectorial thinking and mistrust.

The Smart Citizen Network Board (SCNB) consists of representatives of the district administration, the urban utilities, the enterprise network, the quarter management office and the opportunity project leads. These exchange regularly about ongoing processes in the city and in the district, acting as an innovative multi-level



planning instrument. During its steering meetings chaired by the district key account manager, the Smart Citizen Network Board discusses general needs across Berlin and the ways in which the pilot projects in Moabit are relevant for the city as a whole.

“One of our challenges with citizen engagement has been how to attract those who don’t connect to the idea of ‘smart’ and ‘city,’” says Kuhla von Bergmann. “When we didn’t get the numbers of people we had hoped for the citizen dialogue at the ZK/U, we evaluated, and got critical feedback that how you communicate the project has to have relevance for people’s everyday lives. Knowing what the local community is struggling with is critical to getting people engaged into a dialogue about the future of their district.”

The main focus for the next phase in terms of citizen dialogue will be on producing education material around “smart city” aspects to create a common language with the younger generation and to give the knowledge collected within SSD back to the community.

The District Data Atlas, a database containing all the data relevant to the SSD Moabit development, makes the process transparent and accessible to all stakeholders. This data management catalogue plays a key role in integrating solutions for various urban systems, and supports project management processes.



Stakeholders are desperate for knowledge and evidence. If a water expert from the Netherlands supports a particular perspective, for example, that can really influence and will impact the local readiness to put investment behind it.

Partners

The SSD Moabit team has brought on board several local partners from Mitte borough, the business network, the district administration, city utilities, civil society initiatives.

Engineering firm Prof. Sieker mbh and Berliner Wasserbetriebe (BWB), with TNO and Deltares from the Netherlands are tackling sustainable water management challenges, while RWTH Aachen, CHORA (TU Berlin), TU Munich, TNO and Ökotec are providing expertise on energy efficiency. Mobility scenarios and solutions are developed by ZTG (TU Berlin) and ICL from London. The District Data Atlas tool is being developed by TU Berlin (CHORA) with TU Munich and VirtualcitySYSTEMS.

The project partners in the Climate-KIC network represent a wide range of experts from the private and public sectors and the academic and research community, keen to apply their skills in transforming existing approaches in individual districts into integrated solutions.





The Role of Smart Sustainable Districts in Moabit West

The multi-layered governance structure of Berlin can render decision-making complex and challenging. Being a SSD project has allowed the team to take on the role of broker, facilitator and accelerator, catalysing the much-needed implementation of the Green Moabit plan, according to Kuhla von Bergmann.

The Smart Citizen Network Board, meanwhile, has helped institutionalise a multi-level forum with sustainability goals at the fore. As a result, Moabit has successfully established vital discussion about various topics around sustainable urban development and attracted players to commit to further investment into urban technologies and infrastructure. The project has also gained support from the head of the district built environment department.

“There’s some magic about being part of a European-wide programme and sharing the experience with other districts,” says Kuhla von Bergmann. “Stakeholders are desperate for knowledge and evidence. If a water expert from the Netherlands supports a particular perspective, that can really influence and will impact the local readiness to put investment behind it.”

What’s Next?

Having identified its priorities and work streams, and developed tools and instruments to realise its vision, the next step for Moabit will be to consolidate its outputs and learning, before handing over to local stakeholders. “There will be a position created at the district, funded by national government to continue our management work,” says Kuhla von Bergmann. “There are so many spin-offs and research projects from the SSD work, and we’re looking at grants and funding mechanisms for these.”