



The collaborative route to smart cities

As the pioneering technology leader in digital industries, ABB will accelerate the development of smart cities globally, by utilizing its state-of-the-art cross-industry digital offering and advanced analytic capabilities.

“Smart city initiatives are built on a bedrock of strong partnerships and agile processes. ABB has built a unique position in this space, with founding experience in weaving together technology and infrastructure partnerships across the world, whilst simultaneously helping to shape government policies and standards. We’re delighted to share this insight into ABB's consultation model, which underpins a practical framework that any smart city developer can follow to help turn their visions into reality.”

**Guido Jouret
Chief Digital Officer, ABB**

Introduction

Smart city thinking is driven by urgent and complex needs. The core objective is to make our cities more livable, workable and sustainable. However, everything is happening at pace across the world, including electrification, industrialization, urbanization, a growing consumer class, the shift to next generation digital technologies, decarbonization and renewable energy integration.

Many of the world's fastest growing cities must address fundamental infrastructure requirements, ensuring citizens have affordable and equitable access to reliable power, clean water, sanitation and sustainable transport systems. At the same time there is the need to develop communication infrastructures, housing capacity and attract investment to secure employment opportunities for all citizens.

These challenges are only given renewed urgency by today's educated and connected citizens. Increasingly they demand and deserve environments that facilitate:

- **Enhanced health and wellbeing**
- **An enriched quality of life**
- **Greater efficiency and productivity**
- **Robust communication and mobility solutions**
- **Effective and responsive public services**

Today we can all recognize that smart city progress has been too slow and fragmented across the globe. Planning and decision making has been opaque and often removed from the needs and expectations of citizens.. Popular frustration is growing and all stakeholders are under increasing pressure to deliver results.

The time for grandstanding is over – the planet and its people demand action and results. The 2020s will be a critical decade in leveraging the potential of smart cities.

At ABB, we believe that we can bring a new breed of consultative, collaborative, implementation to accelerate the development of smart cities global market. In this paper, we will introduce our smart city framework and the ABB collaboration model.

Our state-of-the-art digital expertise – evidenced by the ABB Ability™ cross-industry digital offering and advanced analytic capabilities – allied to a vast energy, industrial, infrastructure and transport heritage, makes ABB ideally placed to unlock your plans, enrich your approach and to drive solution delivery.

How does ABB do this?

- **By working in close collaboration and partnership with all city stakeholders**
- **By creating a robust integrated urban framework**
- **By setting clear metrics for success**
- **By being open and engaging with all relevant global standards**
- **By running an agile and inclusive project management approach**

Let's write the future. Together.

Writing the future of smart cities



There are many definitions and interpretations of a smart city in existence today. In fact, there has been a significant evolution in understanding across the 50 years since the third industrial revolution began.

We now know that smart is about intelligent solutions to particular urban problems. We know that smart starts with infrastructural needs, the most important of which is electric power. We know that smart extends to employment opportunities and equitable access to public services and utilities.

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Today, smart city thinking is, rightly, dominated by the twin challenges of sustainability and resilience.

We now know that smart objectives can be supported by small, incremental, interventions, and, crucially, that smart investments can be deployed to sustain and optimize existing infrastructure systems such that they are more efficient, safer, less wasteful and more sustainable.

Success demands new partnerships across the urban ecosystem including public agencies and citizens together with digital, technology and engineering specialists. It requires local expertise and insight allied to global thinking and experience.

Today, every city in the world, no matter their particular constraints (e.g. finance, space), can take intelligent, practical steps toward making their city more livable, workable and sustainable.

At ABB, we see the smart city as being built on four fundamental pillars:

- **Smart Utilities**
- **Smart Buildings**
- **Smart Transportation and Infrastructure**
- **Smart Industries**

The starting point for our smart city framework and collaborative model is the recognition that these pillars are fundamentally inter-related. Their co-dependencies demand a multi-functional approach across all elements of the city ecosystem.

The clearest example of co-dependency concerns electric power and digital technologies. Without investment in power systems then digital adoption only adds to urban pollution problems. Smarter grids and formal access to electric power must take priority.

This integrated approach is critical if our global cities are to successfully manage their anticipated role in absorbing population growth, lifting GDP, managing energy and resource consumption, protecting citizens and building resilience at all levels across the 21st century.

Figure 1.1
ABB sees four pillars of
connected solutions
that support the
smart city ecosystem



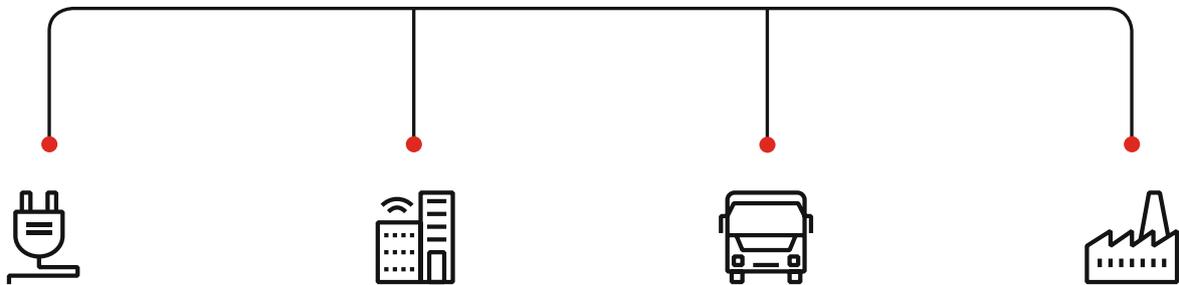
Citizen benefits

- Improved information services with real-time access to service data
- Improved well being & quality of life
- Improved access to public, education & health services
- Greater security, mobility & accessibility
- Improved utilities services



Mobile connectivity and digital control systems

- 5G Network services
- Data analysis & optimization
- End-to-end connectivity



Smart Utilities

- Reliable renewable energy generation & distributed energy resource integration
- Independent power quality & smart grid distribution
- Urban transmission / distribution substations
- Safety management
- Resource maintenance/ management
- Water & waste management
- Network service & digital connectivity
- Emergency systems & responses

Smart Buildings

- Building automation systems
- Energy distribution & storage
- Power quality control network
- Entry & security systems
- Atmosphere & lighting systems
- Mobile connectivity
- Demand side control

Smart Transport and Infrastructure

- E-mobility & scaled fleet and transit EV charging systems
- Commercial & residential charging
- Safety control systems
- Operational maintenance & predictive diagnostics
- Energy systems & response
- Power supply & distribution
- Mobile connectivity
- Dynamic real-time kiosk information

Smart Industries

- Energy distribution & management
- Industrial automation
- Collaborative robotics
- Collaborative operations
- Control & optimization systems
- Mobile connectivity & digital management systems
- Safety & security management
- Predictive maintenance

Digitalization is central to any smart city vision and indeed to the ABB business proposition. By way of a working definition, we see digitalization as:

"The transformation of operations and business models through the application of digital technologies and the integration of data driven insights"

Quality, accessible, data allied to robust architecture and state-of-the-art analytics are fundamental to mapping, visualizing and optimizing these relationships and dependencies at scale. 5G networks are often seen to be critical to the future of the Industrial Internet of Things (IIOT) and therefore to the integrated smart city proposition.

Yet in this complex market it is critical to understand the 'art-of-the-possible' and to work with partners who understand how to leverage and optimize existing infrastructures so that they meet future needs while also delivering current day benefits to help the financing of further projects.



At ABB, we have been partnering with major players in key technology fields for many years, readying ourselves to meet these complex, challenging and exciting requirements. Partners include:

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ABB's existing partnerships building the foundation for the digital future

	Combining Microsoft's smart cloud solution with ABB's deep domain expertise
	Establishing a joint 5G Industrial Innovation Lab
	Combining wireless and smart sensor technologies with industrial robotics
	Developing Wireless for Verticals (WIVE) to meet the demands of 5G
	Utilizing artificial intelligence to develop systems capable of self-inspection
	Leveraging HPE's 'Intelligent Edge' and 'Hybrid Cloud' expertise for true end-to-end, digital solutions

The framework for success

The key requirement for the delivery of a coherent smart city program is an integrated framework that balances the long-term vision for your city with the implications for critical infrastructures.

The framework should be firmly grounded in the specificities of the individual city and should reflect city strategies and vision. In establishing the framework, cities need to recognize the importance and implications of cross-functional working and the creation of an open stakeholder ecosystem.

The framework emphasizes standards, targets and priorities, creating clear accountabilities throughout the process. It also highlights the importance of a strong communications framework inclusive of all stakeholders running throughout the program – including city communities and citizens.

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Figure 1.2
Smart city
framework
and ABB
collaboration
model alignment

Smart city framework

Part One – Build the foundations for success

1. Create a cross-functional city innovation team – with a clear strategic remit
2. Build a multi-stakeholder forum and related networks to initiate planning and prioritization
3. Integrate with existing city plans, targets, visions
4. Establish foundation partnerships with experience at local and global levels

Part Two – Expand focus, understanding and set clear targets

5. Audit data architectures, IT systems and communications networks – get set for integration
6. Think bigger and deeper – make your initial focus key infrastructures and their critical dependencies
7. Agree on key metrics, aligned to global standards and priority targets – in line with your city vision

Part Three – Prioritize, implement and communicate

8. Map smaller, 'quick win' agile project cycles to longer term programs
9. Collaborate with key implementation partners and stakeholders on detailed planning and phasing of projects
10. Launch and maintain an over-arching communications plan to all stakeholders including citizens

ABB collaboration model



Unlock



Enrich



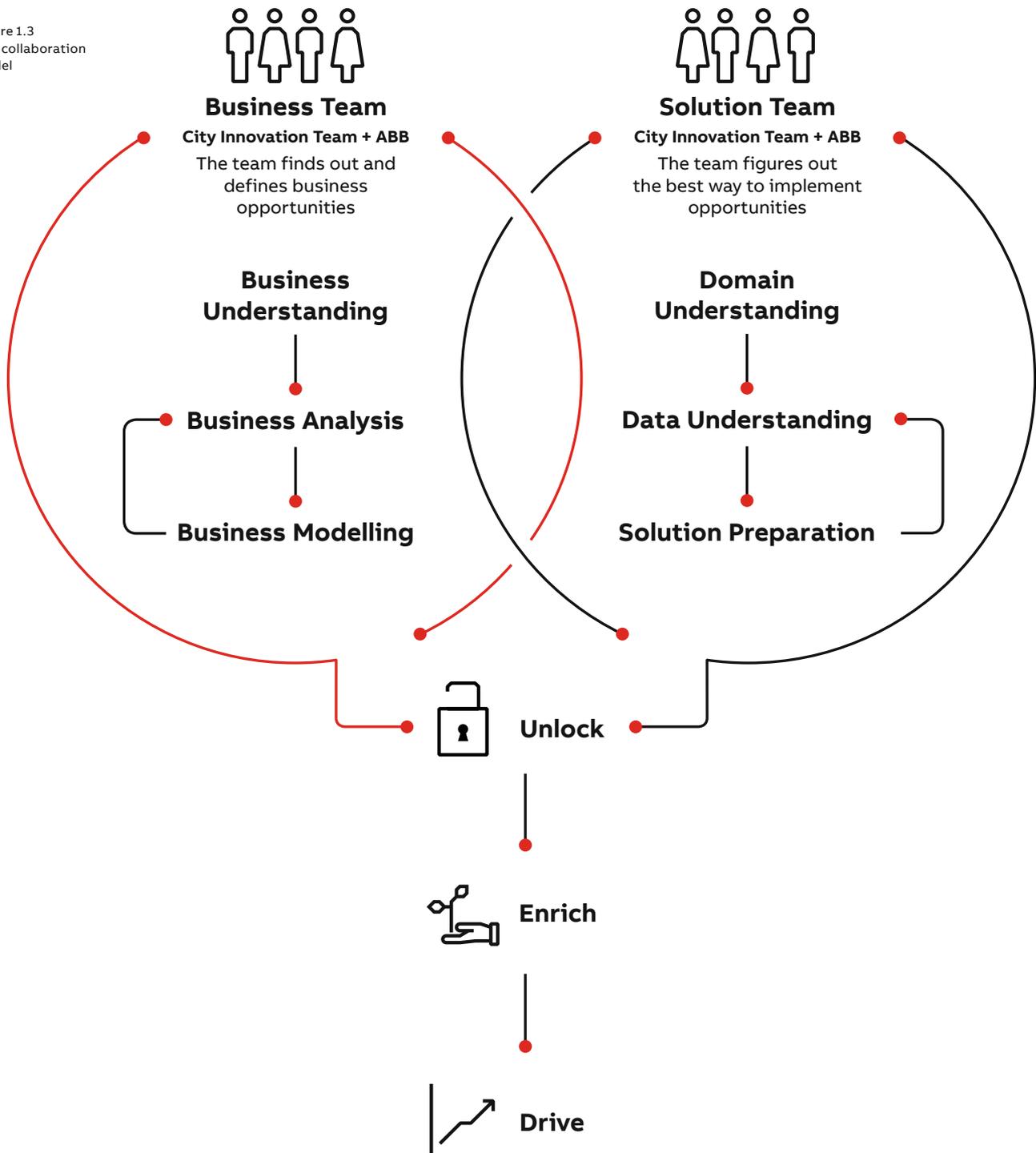
Drive

ABB collaboration model

With the smart city framework in place the strengths of the ABB collaboration model can be fully realized. This is built upon and perfectly aligned to the smart city framework as shown in figure 1.3.

Crucially the model is also focused on implementation through agile project management and collaborative working as illustrated below.

Figure 1.3
ABB collaboration
model



The power of the ABB model lies in the ability to rapidly move through project phases while adhering to the agreed project parameters, from planning and evaluation through to implementation and solution delivery.

Key to success in this collaborative model is the combination of business and solution expertise. Cross-discipline teams addressing problems from every perspective, ensuring the best operational technology, industrial knowledge and civic expertise is blended with data and technology expertise to benefit the city and all stakeholders.

In this way each project acts as a microcosm of the overall city framework, providing confidence in the structure and rigor of the approach. They promote the flexibility and benefits that come with adopting an agile, collaborative methodology.

What is vital to appreciate is that our approach avoids the dangers of more traditional, waterfall project management techniques. Specifically, it overcomes the need to outline all immediate and future outputs in a linear sequence of discrete phases or projects.

The waterfall approach all too often leads to inertia in the face of uncertainty amid fears of being locked into obsolete systems, while making minimal allowance for the changing social, economic, environmental, political, regulatory and, of course, technology landscape.

The agile approach demands a commitment to openness and flexibility that can be challenging for traditional (siloed) smart city administration models. This is why we emphasize the importance of cross-functional innovation teams at the heart of the plan.

The model is fundamentally well-suited to the prioritization of the quick win interventions and solutions that can be vital to building public support for the overall urban strategy. As we have reflected smart does not always mean new – but it should always mean better; with better services and systems supporting urban livability, workability and sustainability.

This fluid approach to delivery places a premium on transparency and communication across the smart city ecosystem, importantly including citizens and communities. As such, communications are built directly into our smart city framework and aligned with the implementation phase.



Working together



In 2017, ABB won a contract with Swedish energy company Mälarenergi to develop smart city solutions to make Västerås, Sweden's fifth largest urban area, a more attractive community for both citizens and industry.

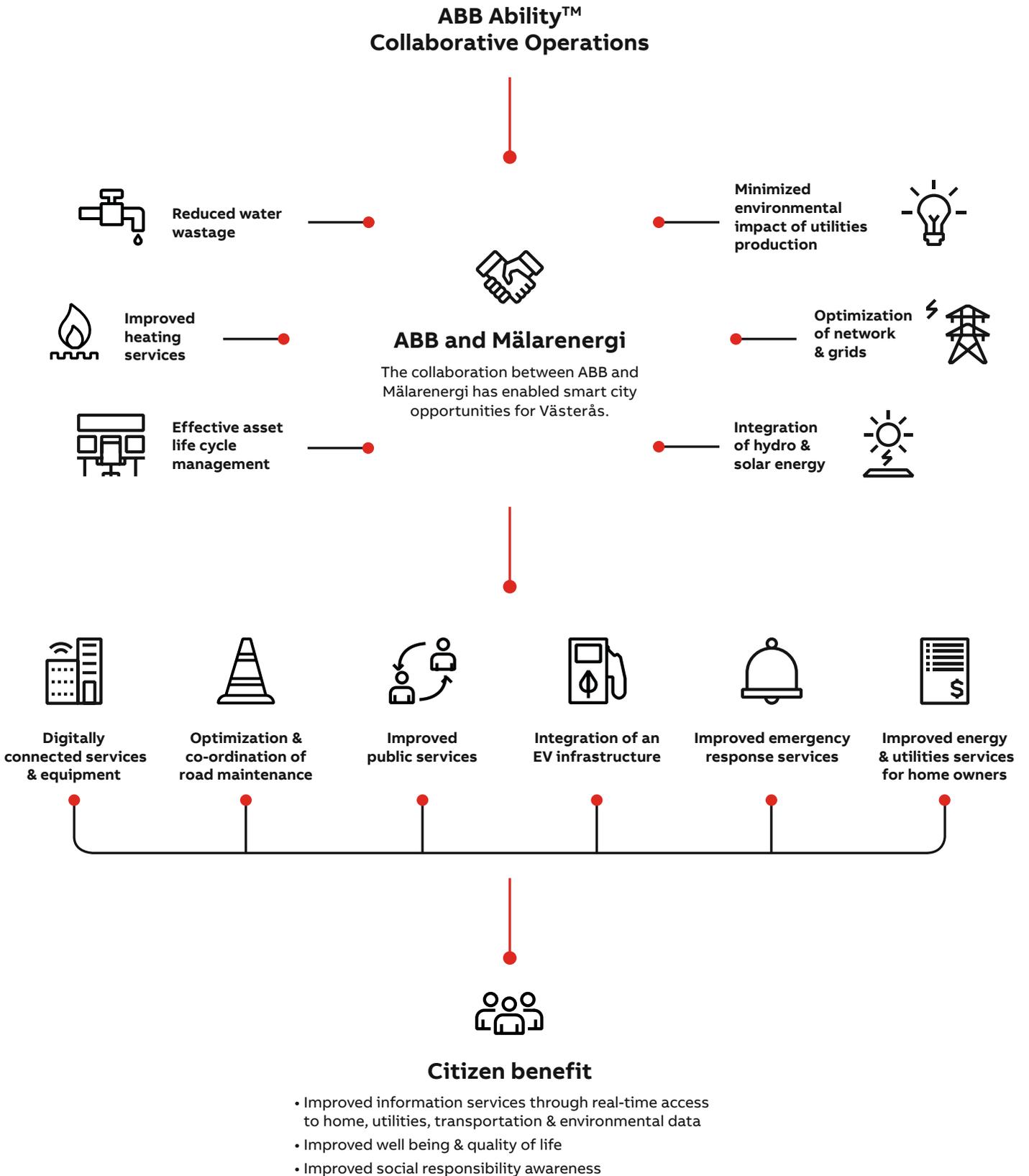
In doing so, we are leveraging ABB Ability™ Collaborative Operations – a digital services platform for customer collaboration, supporting agile development, co-creation and analytics – to integrate best-in-class technologies and services with Mälarenergi's existing operational expertise. This combines the deep control and domain knowledge of both parties, to make more useful information available faster.

The net result of this collaboration is that we can know more, do more, and do better.

Together we are achieving:

- **Cleaner water and reduced loss through leakage**
- **District heating that adds comfort and reduces energy consumption**
- **Better asset management throughout the entire life cycle**
- **Predictable energy production with less environmental impact**
- **Optimization of cost and environmental benefits across the grid**
- **A wide range of smart city opportunities**

Figure 1.4
Mälarenergi –
collaboration in action



Driven by collaboration



Smart city drivers

Across the globe there are a number of ambitious plans and targets set for the 2020s and beyond. These include explicit smart city initiatives including ambitious Industry 4.0 objectives, emissions, air quality and renewable energy targets, as well as phasing out of petrol and diesel engine vehicles.

From a smart city perspective, it has been encouraging to see a range of agencies including the International Telecommunications Union (ITU), International Standards Organization (ISO), the UN and The Smart Cities Council working to establish common standards and KPIs for smart city developments.

At the city administration level we have seen significant growth in the number and role of cross-functional city innovation teams (and related global networks) with a clear remit to create positive, inclusive urban solutions in collaboration with citizens and communities.

We are also seeing more countries introducing smart city competitions to signpost the vision and to incentivize and engage local stakeholders. Countries as diverse as the USA and India have used competitions as a powerful tool for raising the pace of investment.

The growth of open data platforms is another important aspect of the smart city ecosystem, with London and New York seen as pioneers in opening up public datasets; enabling innovators across academia, business and society to access and experiment with the data to generate new insights and ultimately to create new products and solutions.

Just as important, we are seeing the rapid maturation of the global Internet-of-Things (IOT) market with experts forecasting global investment in the smart city IOT market to triple between 2015 and 2020¹. There can be little doubt that an effective, cross-functional, open approach to leveraging the benefits of IOT technology and data flows is critical to the horizontal integration required for a successful, sustainable, smart city.

¹ <https://www.marketsandmarkets.com/PressReleases/iot-smart-cities.asp>

ABB experience

Reflecting the diversity of the market, ABB has been involved in regeneration projects from Sydney to Shanghai, with smart city applications at the heart of new commercial and domestic real estate projects. Other ABB examples include:

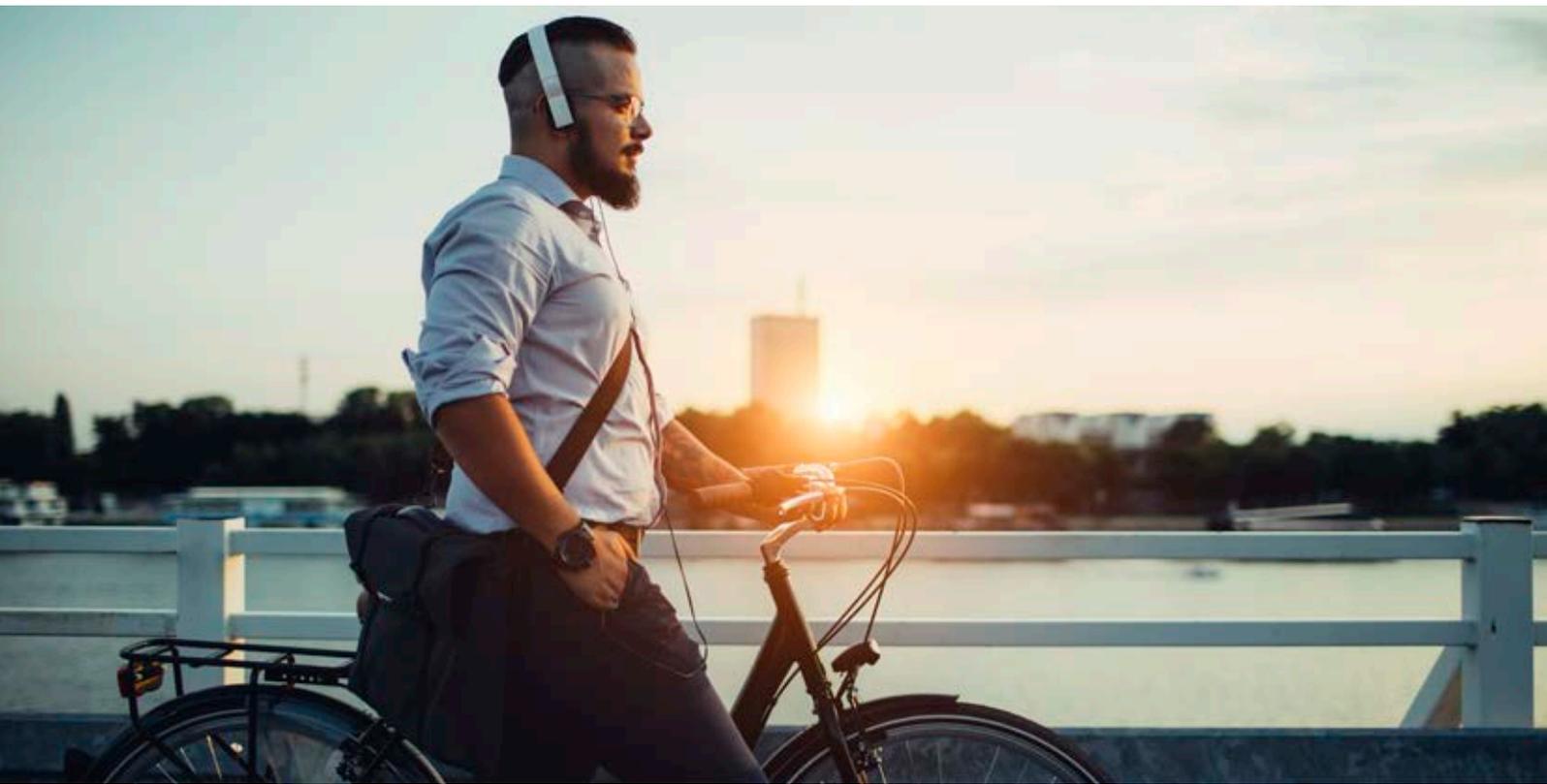
- **Transport electrification across Europe (supporting C40 commitments²)**
- **Advanced EV charging technology in China**
- **Solar plants in North Africa**
- **Smart water system in Ho-Chi-Minh City, Vietnam**
- **Micro-grids in Southern Africa**

We are also engaged in core infrastructure projects across the globe; from ambitious Metro developments in Delhi and Dubai to major industrial digitalization programs in China, and the transformation of power networks across the world.

The ABB Ability™ platform is a landmark in the transformation of ABB capabilities. This state-of-the-art platform is already being used effectively across industrial and utility applications in multiple markets today. The data driven intelligence enabled by ABB Ability™ is, for example, critical to meeting the challenges of today's energy market – especially integrating multiple, varied and volatile inputs.

² <https://www.c40.org/other/fossil-fuel-free-streets-declaration>





Into the future

Research³ suggests that \$13.5 trillion of investment into energy efficiency and low carbon technologies is required before 2030 if the world is to meet the climate change targets set by the Paris Agreement.

Investment in smart cities is crucial to meeting these important targets.

Cities are increasingly taking a leadership role in this space, reflected in the C40 grouping of 90+ of the world's greatest cities (representing 25% of global GDP). These cities are publicly committed to delivering on the Paris targets at a local level, delivering a healthier, sustainable future for all.

While the cost of renewable energy technologies continues to fall across the globe, in the face of urban population growth and increased energy demand, the challenges of successful integration and management are vast and growing, putting major strain on ageing infrastructure in many markets.

Beyond energy, our cities face urgent challenges, from communications to health, housing, security, transport and waste management. At the same time these cities are also engaged in a global competition to attract investment, talent and innovation, to secure future economic growth and prosperity for their growing populations.

As such we would argue that for smart cities today:

- **The need to focus on the four core infrastructure pillars has never been more urgent**
- **The opportunity to leverage analytics, data and digitalization has never been greater**
- **The expectations of smart city delivery have never been higher**

All can be addressed through intelligent, collaborative partnerships combining local expertise and insight with global experience, standards and perspectives.

At ABB, we believe that a new model of consultative and collaborative implementation will accelerate the global smart city market. We continue to seek opportunities at national and city level, forging partnerships with stakeholders, service providers, global vendors and local businesses and organizations.

Above all we continue to extend the same invitation to smart city leaders, partners and stakeholders across the world:

Let's write the future. Together.

³ https://www.iea.org/media/news/2015/press/151110_WEO_Factsheet_EnergyAndClimate.pdf



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