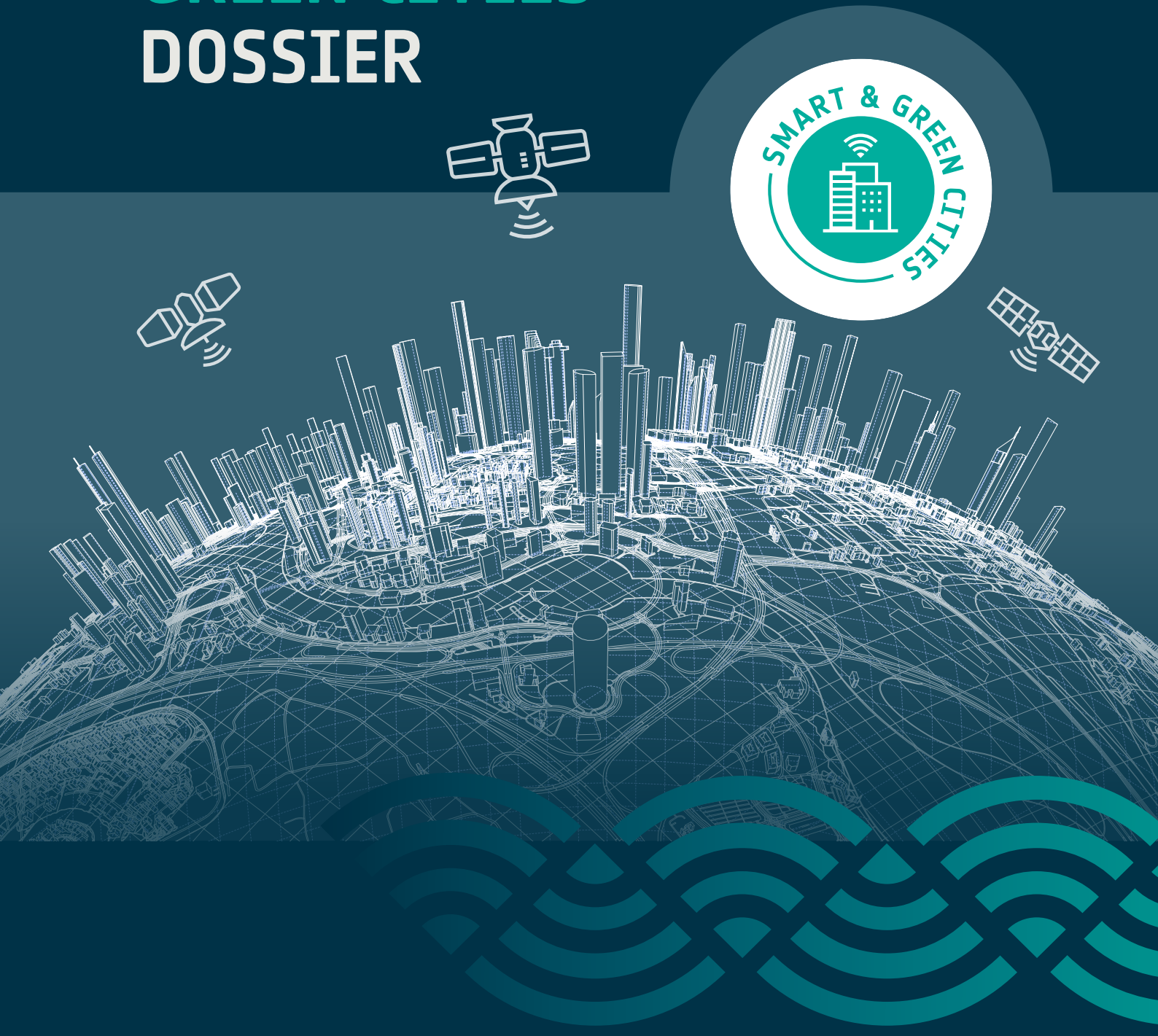
esa

SPACE SOLUTIONS

SMART AND GREEN CITIES DOSSIER



→ THE EUROPEAN SPACE AGENCY

ABOUT THIS REPORT

Through the Business Applications and Space Solutions (BASS) programme and the Space for Smart and Green Cities Taskforce, the European Space Agency (ESA) is supporting international collaboration, partnerships and innovation, paving the way for a more sustainable future, while unlocking the commercial potential in the sector.

The BASS programme has been actively involved in Smart and Green Cities initiatives since 2014. This report provides an overview of these wide-ranging activities, highlighting their tangible socioeconomic and environmental impacts. Moreover, it is an opportunity to showcase the huge benefit for towns and cities that have joined the Space for Smart and Green Cities Task Force to date – while also setting out the ambitions for the future.

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INTRODUCTION

Cities and urban areas are currently home to over half the world's population. According to the UN, nearly 70% of the expected population of 10 billion are projected to be living in cities by 2050. This growth brings significant challenges including environmental pressures, infrastructure needs, quality of life issues and sustainability.

Smart and green cities are addressing these challenges by improving operational efficiency, citizen welfare, and government services in sustainable and innovative ways. Data and information are the core components for the implementation of smart cities solutions – and space-based technologies are playing a crucial role in supporting this transformation.

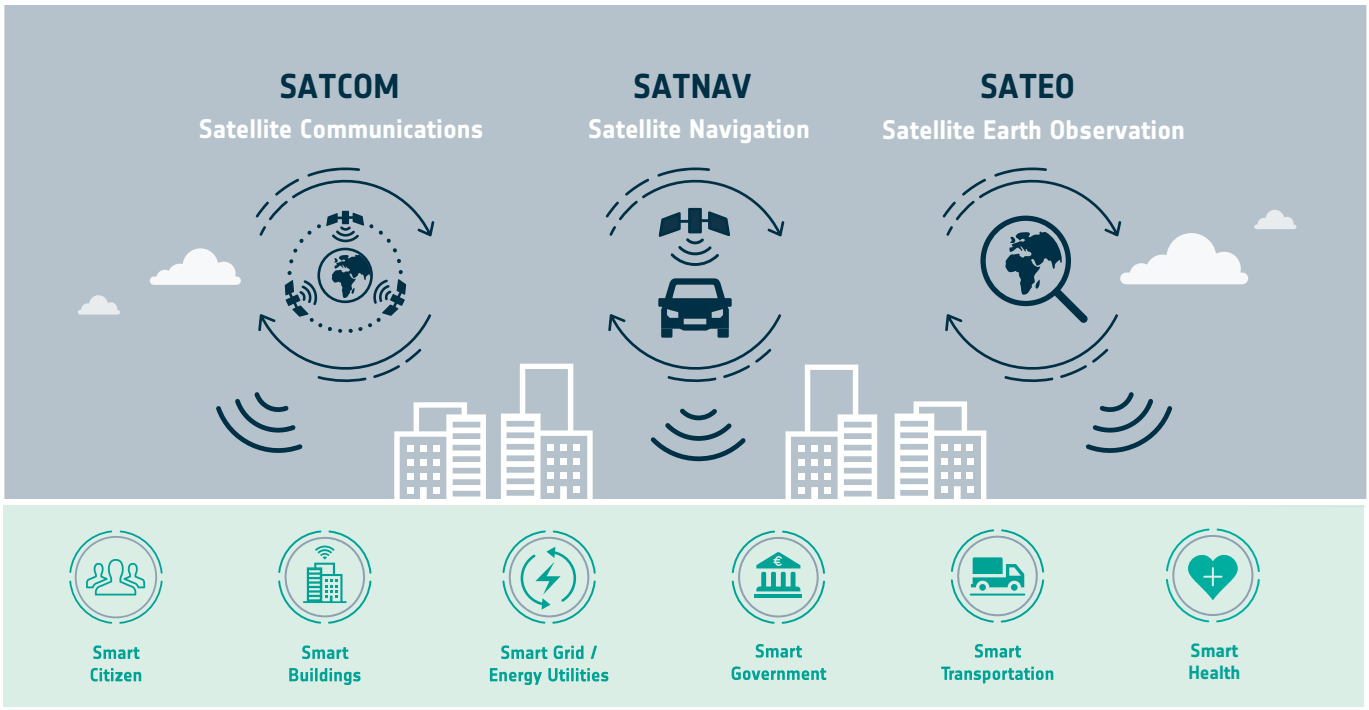
SMART AND GREEN CITIES: CHALLENGES AND SOLUTIONS

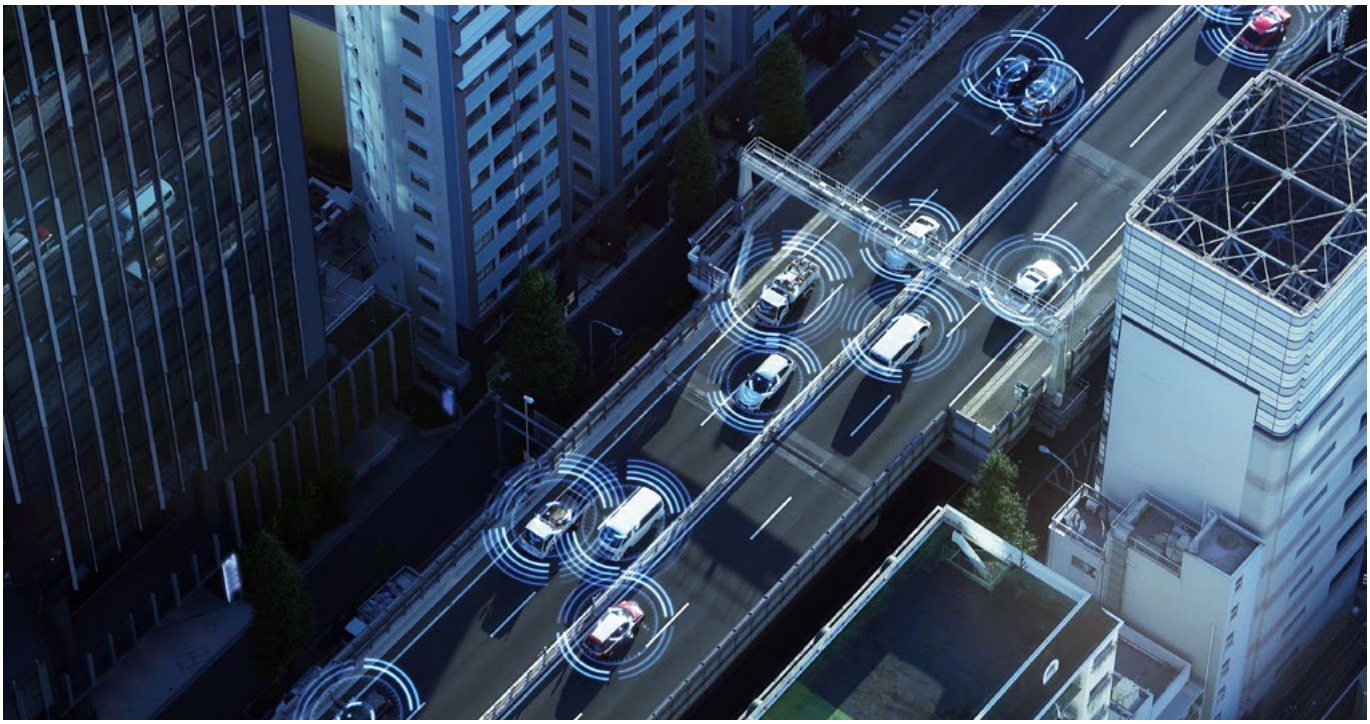
Understanding the challenges that lie on the path to widespread adoption of space-enabled smart city solutions is at the heart of ESA BASS activities. These include:

- technical barriers, such as high initial costs and difficulties in scaling across regional borders
- business proposition implementation barriers, for example relating to fragmented markets and lengthy procurement processes

THE ROLE OF SPACE

Practical applications of space-based technologies in urban environments are already all around us. They have a key role to play in the ecosystems of smarter and more sustainable cities, both as a technological enabler and in supporting the development of cost-efficient business models.





INVESTMENT FROM BASS

10 years of space-based applications for the smart cities sector

BASS is working with and supporting urban authorities and businesses to find the most effective innovative solutions to the challenges they are facing, and at the same time to help them tap into the global smart cities market, which is expected to reach around US$4.605 trillion by 20331, growing at a Compound Annual Growth Rate of 19.7% from 2024 to 2033. This growth is largely driven by municipalities' urgent needs to manage growing urbanisation sustainably.

Over the past 10 years, €33.88 million (58.7% from BASS and 41.3% from industry) have been invested in 66 Smart Cities-related activities.

Total Investment of 33.88M EUR

19.68 / 58.7%
Euro invested by ESA BASS

14.20 / 41.3%
Euro invested by industry

Investment details at a glance

10
Countries

66 Projects
30% being demonstration projects

50% of projects made sales during the pilot phase

46%
SMEs

1. https://market.us/report/smart-city-market

TIMELINE OF BASS ACTIVITIES

2019

- 5G for L'ART (L' Aquila, Abruzzo Region, Rome, Torino) – Cultural heritage, Law enforcement and emergency response, Intelligent transport and Structural monitoring – L' ART

2021

- Urban Green
- New Education

- Space Applications to Advance Innovation on Circular Cities
- Space for Urban Air Mobility

2022

- Space for Green Construction
- Post-COVID Health and Well-being
- 5G/6G Services

- Space for Olympic Games
- Space Applications Supporting Digital Transformation in Public Safety

2023

- Satellite Connectivity for Autonomous Land Vehicles Safety

- Sustainable Micromobility
- Future of Work for Sustainable Growth

2024

- Commercial Applications of Space-enabled Robotics: Smart Cities and Infrastructure

- Commercial Applications of Space-enabled Robotics: Transport and Logistics
- Space for Sport, Culture and Education Infrastructure

2025

- Space for Electromobility
- Space for Intermodal Transport
- Space for Sustainable, Connected and Liveable Cities

- Space for Urban and Peri-urban Agriculture (UPA)
- Coastal Resilience to Climate Change

MOBILITY INFRASTRUCTURE

This is the Smart Cities topic that has received the largest BASS investment since 2014, totalling 14.53 MEUR. Implementing effective and sustainable urban transport systems is a vital element in reducing greenhouse gas emissions, as well as ensuring the effective flow of people, goods and services. There is high market maturity, demand and opportunities for advance technology solutions, as transforming mobility systems is a prime focus for many cities.

CASE STUDY | RIDETANDEM

RideTandem offers eco-friendly shuttle services for businesses, schools, and towns.

It has covered more than 2 million journeys and saved 4000 tonnes of CO2.

Country: United Kingdom
Region of trial: United Kingdom
€640K invested

BUILDINGS AND CONSTRUCTION

The rapid pace and scale of urbanisation pose significant challenges for cities, such as meeting the growing demand for affordable housing, reliable infrastructure, and basic services – all whilst balancing sustainable growth. This is a mature market for solutions that leverage technologies such as augmented reality and virtual environments.

CASE STUDY: E04BELMAP

E04Belmap is a 3D digital twin platform for Benelux city management. It has been purchased by utility and logistic operators and insurance companies.

Country: Belgium
Region of trial: Belgium, Netherlands, and Luxembourg
€800K invested

URBAN GREEN

Together with Buildings and Construction, this topic is closely connected to the Smart and Green Cities Task Force priority area of Urban Development. By adopting urban greening, for example through using rooftops and brownfield sites for sustainable purposes, it is possible to significantly reduce heat hot spots, improve liveability and support urban resilience to extreme weather events in urban areas.

CASE STUDY | URBAN VIEW

Urban View: Used by several cities which want to implement effective climate mitigation strategies, the service helps them identify and monitor urban heat islands as well as the health and the growth of urban vegetation.

Country: Germany
Region of trial: Germany
€1 million invested

UTILITIES

Cities consume 75% of global primary energy and require a constant stream of power. At the same time, they emit 50-60% of direct energy-related greenhouse gas emissions. A sustainable urban energy system requires low carbon technologies, efficient distribution infrastructures and lowered consumption levels – and it is a must for a reliable and robust energy supply to cities for the long term.

CASE STUDY | HUMAN SWITCH

Human Switch supports the transition to using electric vehicles.

The app has been downloaded by more than 5K users covering a combined total distance of 2.7 million miles.

Country: United Kingdom
Region of trial: United Kingdom
€2M invested

EXTREME WEATHER AND ENVIRONMENTAL RESILIENCE

The changing global climate poses a huge threat to urban environments, and in recent years there has been an increase in the frequency and severity of natural disasters in cities all over the world. A high number of Kickstart activities in this area suggests a younger market for space applications, with lots of opportunities to develop new services or products.

CASE STUDY | INSURAPP SERVICE

Insurapp Service predicts and prevents floods using multi-sourced data. The solution is currently being used by several insurance companies and water authorities.

Country – Netherlands
Region of Trial – Australia, South Africa
€320K invested

ADDITIONAL CASE STUDIES

CASE STUDY | AIRMINE

Service to monitor air quality in the cities and pollen presence which can contribute to serious health disease.

The Airmine app has been downloaded over 70,000 times and citizens have used it to report symptom severity linked to air quality.

Country: Finland
Region of Trial: Europe
€2M invested

CASE STUDY | MYLO

Mylo offers a project management solution for monitoring construction projects.

Solutions very appreciated by construction companies that can manage the entire project delivery process.

Country: United Kingdom
Region of Trial: United Kingdom
€1.1M invested

CASE STUDY | EYES ON PLASTIC

Eyes on Plastic maps plastic litter using satellite and crowd-sourced data.

The service has considerably improved the detection rate.

Country: Germany
Region of Trial: Italy, Indonesia
€1M invested

INTERNATIONAL COLLABORATION: SPACE FOR SMART AND GREEN CITIES TASK FORCE

Working in partnership with non-space sectors is at the heart of ESA's BASS programme. The first partnerships with cities were formally established in 2019 when the first Smart and Green Cities BASS initiative was launched.

Fostering a close and continuous relationship with cities across Europe and beyond is key. There are huge benefits for cities in becoming Task Force members and joining BASS initiatives, not least the opportunity to play a strategic role in helping ESA identify the most pressing topics to progress with concrete projects.

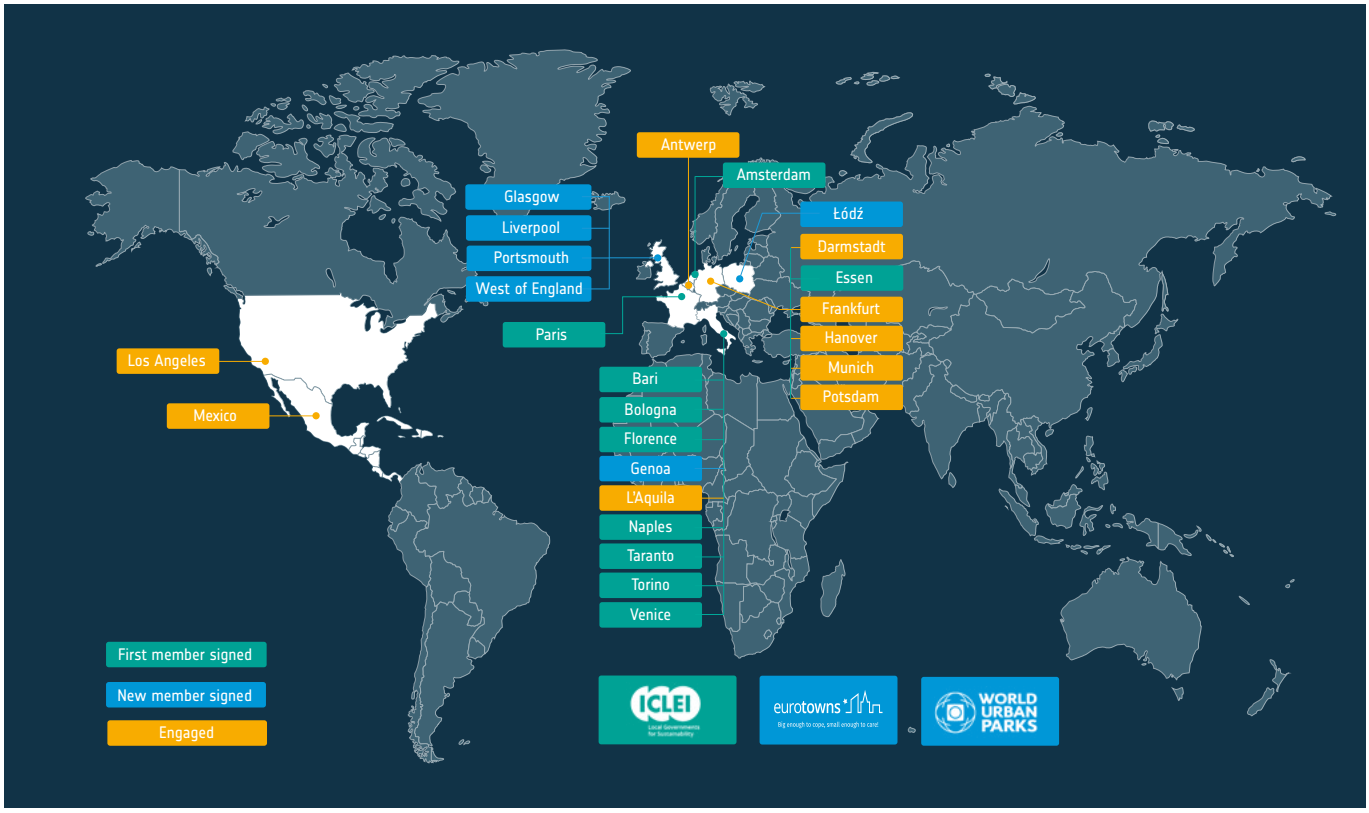
These partnerships open the way for global, holistic discussions, helping to identify more opportunities to use space assets and data in response to the challenges these cities are all facing. Crucially, the collaborative approach helps oil the wheels of urban change, by mitigating and overcoming common barriers to implementing business propositions, such as:

- complex public tendering processes
- resistance to switching providers
- difficulties in scaling solutions across borders

THE BENEFITS OF JOINING THE SMART AND GREEN CITIES TASK FORCE

Since launching in Rome in 2023, a growing number of cities, municipalities and city networks from all over the world are recognising the value of joining the Task Force. It is an opportunity to:

- benefit from international cooperation, partnerships and shared experiences
- lead the agenda to future-proof urban environments with space technology
- drive the development and delivery of innovative projects, technology trials and user-driven solutions to achieve smarter and greener cities all over the world



Locations of members of the ESA BASS Space for Smart and Green Cities Task Force.

The role of the Task Force is to:

- provide up-to-date landscaping of smart cities' challenges
- select a list of thematic areas of interest of the cities, where space can have a strong added value
- identify and agree on the short/medium/long-term priorities of the selected thematic areas
- propose specific initiatives related to space applications in the selected thematic areas to be undertaken with partners of the Task Force.

THE TASK FORCE'S KEY PRIORITIES

Urban development

Support sustainable urban development and cities' growth by reducing the environmental impact related to activities in the cities creating and maintaining healthier, more sustainable places to live and work.

Sustainable mobility

Address the challenges related to the evolution of the mobility sector in cities reducing emissions, improving city infrastructure and supporting a green transition while addressing the evolving needs of mobility of citizens.

Efficient energy

Support the provision of a secure, sustainable and efficent supply and utilisation of clean enery, as the risks of climate change and the need to reduce our carbon footprint grow ever more real.

Wellbeing and inclusiveness

Create positive impacts which are environmental, societal, and economic, improving the quality of life for all citizens.

OUTREACH AND IMPACT

A busy programme of outreach activities is one of the most impactful aspects of the Smart and Green Cities Task Force for the smart city stakeholder community.

The four key positive benefits achieved through outreach activities are:

Raising awareness of space application for smart cities

1

Raising awareness of the often little-understood benefits of space technology and fostering valuable connections among user communities.

Match-making with potential users and customers

2

Opening new leads and boosting export opportunities for small and medium-sized companies.

Widening the network of stakeholders

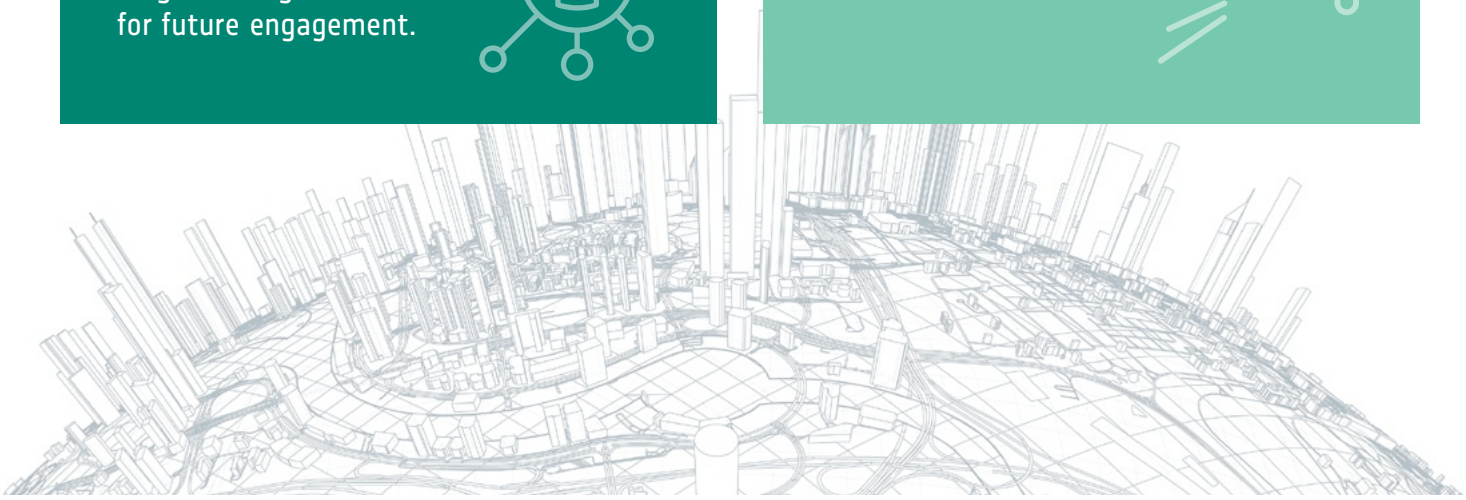
3

Achieving a closer collaboration with existing city authorities and stakeholders, as well as generating new leads for future engagement.

Increasing impact

4

Enabling companies to showcase their offering and increase the visibility of their products or solutions.



FUTURE PLANS

With nearly €34 million invested over the last 10 years, ESA's BASS programme has already been instrumental in bringing cities together for a holistic approach, and helping businesses commercialise their space-based innovations for tangible results in tackling city-related issues.

Many more ESA BASS initiatives are already open or in the pipeline with an intended focus on expanding the engagement of cities from non-European countries and to help make cities more resilient to extreme climate-related events. This includes topics such as Coastal Resilience, Climate Change, Safety and Security along with the use of digital solutions such as High Performance Computing (HPC) infrastructures.

CONCLUSION

Cities and urban spaces are growing exponentially and with that growth comes increasing pressure to deliver sustainable, safe and well-functioning environments for people to live and work in, providing the services they all need, while building in resilience to impacts from climate change.

An innovative and collaborative approach is needed to support the necessary transformation to futureproof the Smart and Green Cities of tomorrow. Space applications have a key role to play in this.

Are you interested in finding out more and help leading this positive change towards sustainability, while having a front row seat to benefit from shared expertise, experience, innovations and collaboration? Get started by emailing business@esa.int

Find out more about ESA's work on Smart and Green Cities on our website.

Sign up for our quarterly Smart and Green Cities Bulletin