



# Space4Ghent: Satellite data improving life in cities

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## The Eurisy “Space for Cities” Initiative

In Europe, 72% of people live in cities. The concentration of people is functional to economic growth and increasing human capital. Nevertheless, it also generates challenges in terms of physical and administrative infrastructures, environmental sustainability, social inclusion, and health.

To address the challenges of urbanisation, it is today necessary to develop new integral approaches to city management, leading to sustainable urbanisation. A city is sustainable when decisions are made by considering their effects with a holistic approach, taking into account different areas, such as transport, health, environment, and education, and their correlations.

Satellite applications are by definition objective, sharable and scalable. They offer unique opportunities to visualise a number of parameters throughout time that can be used by different city managers and cities within the same region. The Eurisy [Space for Cities](#) initiative aims to explore current and potential uses of satellite applications to make our cities healthier, cleaner, safer, and more efficient, with the aim of promoting the development of increasingly efficient and user-friendly satellite-based services.

## The “Space for Ghent” Conference

The City of Ghent believes that citizens are the main agents of change. Empowering them is thus the key to building a smart city. Having already experienced the benefits of satellite navigation to improve public transport and urban mobility, the Municipality is today interested to know which information can be obtained by satellite imagery and how this can be used to improve life in Ghent.

To this scope, the City of Ghent accepted the invitation of Eurisy and the Belgian Federal Science Policy Office (BELSPO) to hold a dedicated conference on the uses of satellite imagery in cities. The conference was organised within the 8<sup>th</sup> edition of [Apps For Ghent](#), an initiative aimed at maximising the potential of open data in Ghent through projects, events and co-creation.

One hundred representatives from private companies, public managers and students attended the conference to discuss current and potential uses of Earth Observation in urban spaces. Participants were made aware of existing datasets, the Copernicus services in particular, as well as their possible applications at the city level. The event also discussed the obstacles hindering the exploitation of satellite data and put forward possible solutions to overcome them.

A dedicated lesson on the uses of satellite-based data was also organised on the eve of the conference. As a follow-up, on March 17<sup>th</sup> the Apps For Ghent Hackathon shortlisted five ideas to use satellite-based data to develop mobile or web applications to improve life in Ghent. The “EggsForGhent” team has been awarded a special prize from BELSPO. The team will get access to the Open Day of the ESA European Space Research and Technology Centre (ESTEC) in Noordwijk, the Netherlands. The SpaceEggs idea is to develop a user-friendly platform for policy makers to visualise the city’s evolution through satellite imagery.

## Main messages from the conference

Data collected in cities have a strategic role to play to foster cities' efficiency and sustainability. Nevertheless, it is not technology what makes cities smart; but smart people making smart use of technologies.

*"Data collected in cities are 'digital commons', which must be shared and put to use through the collaboration among all stakeholders, including government, academia, the industry and city residents, which are not mere 'end-users' but co-creators of the social change".*

**Karl-Philip Coenegrachts, Strategy Manager, City of Ghent**

In the last decades, a huge amount data has been collected in cities, about the features of the land, the quality of the air, the movements of the soil, the buildings, the parks, and about their inhabitants, their movements, behaviours and preferences.

**No software or algorithm alone can make sense of these data and put them to use to respond to cities' needs but the citizens themselves.** Leading administrations have thus set up citizen feedback collection mechanisms and made the data available for anyone to use. By making **open data portals** available for citizens themselves, they allow inhabitants to come up with ideas on how to better make use of the data.

Such mechanisms are to be based on the principles of **co-creation** and **multi-disciplinarity**.

Urban challenges should not be faced by single city departments, companies or communities. Instead, different points of view on common issues can lead to the development of better, more comprehensive and farsighted solutions.

**To address the challenges of urbanisation, stakeholders should not work "in silos".**

*"EO is an extraordinary tool. However, in order to fully benefit from it, EO experts need to work jointly with other scientific disciplines and closely with the local authorities in order to have all the elements to address the complex challenges of urbanisation".*

**Mario Hernandez, Special Consultant, UNESCO**

Cities face challenges such as climate adaptation, health, pollution, and competitiveness. Such issues are too **complex** to be addressed only by one perspective, be it the one of geosciences, architecture or engineering. Instead, they require the expertise of a wide range of scientific, technological and social disciplines.

To develop satellite-based services that will be used in cities in the long-term, space agencies and private companies acquiring or processing Earth observation data need to work cross-sectorial Experts

from other disciplines, especially **social and economic sciences**, and the **local authorities** themselves should be engaged since the beginning.

**Co-ordinating needs among different city departments or among different city actors** can also help reduce the costs of developing such solutions. Indeed, different city departments can use the same set of data, or work together to develop a common software or processing chain to respond to a common issue. This is the case in Lemvig (Denmark), where the entities responsible for managing water pipes and roads are joining forces to acquire satellite-based data on soil subsidence that both services need.

*"I have learned that there are so many uses of satellite-data. But I also learned that we need to exchange and collaborate with other countries. Right now, we need user stories to communicate on the uses of satellite data in cities and get other public administrations interested".*

**Lars Holmegaard, Lemvig Water and Wastewater Company**

### Services based on Earth observation data are today proving their added-value to monitor infrastructure, pollution and risks in cities.

Which each passing year, Earth Observation datasets are gaining in spatial and temporal resolution, whilst becoming more accessible and known amongst city authorities. Some applications — especially for soil, infrastructure and air quality monitoring — have left the realm of R&D and entered the market. This result could not have been achieved without the efforts of satellite operators, IT companies, governments and local administrations.

The cases of use of Earth observation data presented by local managers and private companies showed that EO can help cities to better manage the public space and the environment, while increasing efficiency. In Lemvig (Denmark), EO allows for better managing of water and wastewater pipes, and its use is expected to generate €500k of revenues per year. In the "Confluence" neighbourhood of Lyon (France), the use of EO data allowed to reduce by 50% the costs to monitor PV systems on rooftops.

Private companies from Belgium, France and the Netherlands also showed different products embedding Earth observation data to monitor air pollution. In several European cities, such information is used to alert vulnerable persons in case of pollution peaks or to better model traffic. An application that was particularly appreciated by the youngest attendants is the use of Earth observation data to assess light pollution. A phenomenon that not only prevents people living in cities from enjoying the night sky, but which also has a negative impacts on ecosystems within and around urban areas.

*"Cities have pretty much the same questions about Earth observation that they had 10/15 years ago. The difference today is that, thanks to initiatives such as the INSPIRE Directive or the Copernicus Programme, the answers provided can actually be implemented."*

**Dennis Devriendt, University College Ghent**

Online portals are making Earth observation data more accessible to local managers. However, using the data still requires technical skills.

The gradual uptake of satellite-based services in cities is being facilitated by the creation of **online portals providing free and paying raw satellite-based data**. The **Copernicus Programme** is the most remarkable **open-data initiative** undertaken at the European level. Within the Space4Ghent conference, Eurisy and the Apps4Ghent consortium organised a one-hour lesson on the **Copernicus Land Monitoring Service**, delivered by a representative of the European Environment Agency. The service allows private and public organisations to **process and download Sentinel data** on land cover and use, as well as on variables related to vegetation state and the water cycle.

The Copernicus programme has been conceived as a tool for economic development and as a driver for the digital economy. Nevertheless, **distributing and making sense of the data is still a challenge**. To **profit from the possibilities offered by the Land Monitoring Service**, cities need the **support of staff with a good knowledge of coding, IT and GIS**. Such skills are necessary to access and process satellite images, and visualise on maps specific land features and their changes over time.

*"A useful comment we bring home to the Land Monitoring Portal is the overall accessibility of data. Currently, the portal still serves data in a straightforward but traditional way. Access is easy going for viewing and download, but access through services still requires expert knowledge. We are working towards improving this latter aspect in the next generation of the portal, which should become a one-stop-shop for accessing and analysing Copernicus land data".*

Ludvig Forslund, Copernicus Land Monitoring Service

Creating different data portals might seem redundant, but competition and emulation could accelerate the creation of increasingly intuitive portals.

Nowadays, satellite navigation and satellite communications have found a big number of applications, thanks to the ideas of professionals working in all sorts of fields. In the future, increasing education on satellite services could lead to similar developments in the use of satellite imagery. To start such a process, and with the aim of making satellite-based data and services available to the greatest number of people, the European Commission is building five **Copernicus Data and Information Access Services (DIAS)**. Providing data and information access alongside processing tools, the DIAS should offer **cloud-based data processing**, with no more need for heavy data downloads.

Numerous other data portals are also being developed by private and public entities and within projects. As an example, **NextGEOSS**, funded under the Horizon 2020 scheme as the European contribution to GEOSS, has a special focus on encouraging and stimulating data exploitation by businesses. Also in this case, online processing tools are provided to avoid downloading big amounts of data. **Capacity building** is at the heart of NextGEOSS and the project will identify training needs to encourage wider user-engagement with EO data and its commercial potential in the next 3.5 years.



**Data portals** are also being created at the **national level**. In Belgium, the **Terrascope** portal, operational as of April 2018, is the portal to the Copernicus data for Belgium, providing data that public administrations and businesses can use.

The proliferation of data portals might seem to add an additional challenge to city managers interested in satellite-based services, who could be confused when looking for the best data or service to suit their needs. Nevertheless, thanks to **competition** and **emulation**, such multiplication of portals could be functional to the development of better, more user-friendly data portals and satellite-based services, and facilitate the uptake of such services at the local level.

**Involving city actors in the development of Earth observation data portals** would also help ensuring the usability of such interfaces and the relevance of the data provided to cities' operational needs.

**The “big data challenge” for satellite imagery is to move towards smarter systems for city managers to access and understand the information.**

For politicians and public managers to understand the possible uses of satellite-based services, it is fundamental that the information delivered is as intuitive as possible. During years, GIS developers have been producing flashy-coloured maps containing information that remained encrypted to the inexperienced eyes of those who were supposed to use it to deliver better public services. Indeed, even when satellite-based maps are pre-processed and delivered to local managers as “ready-to-use” they can still be difficult to understand. To give an example, it is not unusual that green areas are showcased in red on satellite-based maps, or that buildings are violet.

This gap between the “codes” of those who provide satellite-based services and those who are supposed to use them can be filled by **increasing dialogue opportunities among data providers, ITs, and the “potential users”** working locally in fields as different as urbanism, environmental protection, health, transport, waste management, risks, etc. This is not only important to foster the use of satellite-based data, but also to involve as many as possible in the development of **new ideas** to put them to use.

Another effective way to distribute satellite data to private and public organisations locally is to **embed Earth observation data in cities' open data portals**. Most European cities are making available open data to foster their use, especially by private companies and entrepreneurs. Satellite-based data should be accessible through these same portals. Indeed, most city departments and private companies will not care about the provenance of data, but about their accuracy and usability. Concerning usability, it is also important to consider the **standardisation and processing of Earth observation data**.

In Flanders, the Region has developed an online “**Image processing chain**” gathering and making available remote sensing data on Flanders. The portal also offers on-demand processing of the data into new geographical information. As a virtuous example for other European regions, the image processing chain is part of **Flanders Radically Digital**, an online database of digital information on the whole Flemish public administration.

The added-value of local open data portals as compared to portals especially dedicated to satellite-based data is that they are consulted by a greater variety of city actors. This means that Earth observation data can reach a much bigger number of people, and that new ideas to use them can potentially emerge from the whole city ecosystem.

*"The real challenge is to make the whole urban ecosystem aware of the potential of Earth observation data to improve quality of life in their city".*

Nicolas Beaugendre, General Manager, KERMAP

### Cities are, at the same time, the object and the actors of innovation

Local administrations have a crucial role to play to foster innovation. Bringing innovation in the way local administrations work and providing cities with innovative tools to deliver public services will be fundamental to grant Europe's **welfare** and **competitiveness** in the future.

At the same time, local administrations can also foster the use of existing satellite-based services and boost the development of new services through their **procurement** policies. Indeed, local governments alone were responsible for 44% of public investments in the EU-28.

The major role of cities in fostering innovation in Europe has been today recognised, while cities themselves are looking for strategies to boost their efficiency and competitiveness through innovative solutions.

The **European Innovation Partnership for Smart Cities and Communities**, launched in 2011, is working to establish strategic partnerships between industry and European cities to develop the urban systems and infrastructures of tomorrow. Eurisy is working with the Partnership to make sure that satellite-based services are part of this process.

*"Europe's future will be made in and by cities and regions".*

Daniël Termont, Mayor of Ghent

## Conference proceedings

The “Space for Ghent” conference was hosted by the Data and Information Service of the Municipality of Ghent at the E-gebouw Building.

Participants were welcomed by Ms **Dominique Tilmans**, former Belgian Senator and current Eurisy President, and by Mr **Dirk Frimout**, one of the two eminent citizens of Ghent who had the opportunity to look at Earth from space, flying aboard NASA Space Shuttle Mission STS-45 back in 1992.

## Keynotes

The Keynote session, moderated by **Jean-Christophe Schyns**, Programme Manager at BELSPO, introduced the audience to the topics of sustainable cities and satellite applications.

**Karl Filip Coenegrachts**, Chief Strategy Officer at the **City of Ghent**, opened the session with a speech on “The importance of citizens’ engagement to foster innovation in cities” ([LINK](#)). His presentation pinpointed the strategic role of data for cities’ development and the importance of involving citizens to “make sense” of the data and its best possible use. In his vision, data collected in cities are “digital commons”, which must be shared and put to use through collaboration among all stakeholders. This includes governmental bodies, academia, industry and citizens, which are not mere end-users but co-creators of the social change. This change shall not be driven by technology, but by the city’s inhabitants themselves. To him, “*Cities need to reinvent themselves constantly: the society, the psychology, the hearth and software of the city change*”. Karl-Philip then listed a number of projects aimed at fostering dialogue in Ghent, and gave examples of initiatives, such as the open 3D model of Ghent, for which satellite data could provide added value. In 2017, 3 million Euros were invested by the City of Ghent to implement projects designed by the citizens themselves.

**Jacques Nijskens**, General Manager at BELSPO, delivered the second keynote speech on “Support and funding opportunities to develop and use satellite-based services in Belgium” ([LINK](#)). Belgium is the 5<sup>th</sup> main contributor to the European Space Agency. Indeed, the country’s contribution to the Agency represents around 90% of the national space budget. In parallel, BELSPO also supports national programmes, such as STEREO, aimed at promoting high quality research in the use of Earth Observation to respond to social and environmental challenges. Furthermore, a new initiative has been launched in 2018, the ESA Space Solutions Belgium. The new programme supports entrepreneurs to exploit space technologies to develop non-space businesses on Earth and the other way round.

**Mario Hernandez**, Special Consultant at UNESCO, closed the keynote addresses with a presentation on “Safeguarding Heritage to build Sustainable Cities and Communities: How satellites can help” ([LINK](#)). Mr Hernandez underlined the importance of natural and cultural heritage to sustain cities’ economies, foster social cohesion and make cities more resilient, hence contributing to the achievement of the UN Sustainable Development Goal 11. He recalled the activities jointly implemented by Eurisy and UNESCO in past years, and presented the ESA-UNESCO Open Initiative on the use of space technologies to support natural and cultural heritage. Mr Hernandez underlined the need to discuss with those in charge of managing heritage the way in which the information is presented, in order to make it



understandable and ready-to-use. Satellite-based maps give us the possibility to highlight problems and, most important, solutions. We need to focus on the latter to accelerate the development and uptake of satellite-based services within and around cities. Mr Hernandez then provided several examples of how satellite data is employed to better manage cultural heritage, e.g. tracking tourists to manage people flows in Rome, create 3D reconstructions of archaeological sites in Campeche, or to monitor the impact of urban sprawl on the archaeological sites nearby Cairo.

## Earth observation for cities: the European framework

Moderated by **Toby Clark**, Secretary General at **Eurisy**, this session introduced the audience to the Copernicus programme and its derived services and datasets.

**Annekatrien Debien**, from the **Copernicus Support Office**, gave a first “Introduction to the Copernicus Programme” ([LINK](#)) of the European Union and to the six derived services. The programme provides data to public administrations and its citizens to be used in a variety of fields, such as crisis management, and contributes to the EU’s role as a global soft power. Moreover, Copernicus is meant to be a tool for economic development and a driver for the digital economy. Ms Debien explained that Copernicus data are being made available at least until 2030 under a full, free and open data policy, also to stimulate businesses downstream. The challenge today is to distribute and make sense of the huge amounts of data produced by the Sentinels. To overcome this “Big Data challenge”, hubs and online portals are under development. The new cloud-based Data Access and Information Services (DIAS) are expected to facilitate data dissemination. The portals will allow for raw data download and – most importantly – will provide cloud based pre-processing of information. Thus, alleviating the need for heavy data downloads.

**Ludvig Forslund**, GIS consultant at the **European Environment Agency (EEA)**, further elaborated on the subject with a presentation on “The Copernicus Land Monitoring Service and its potential to enhance quality of life in cities” ([LINK](#)). The service, managed by the EEA, provides images and data on a number of parameters on the land and its uses. The Land Monitoring Portal, which was the object of a dedicated lesson on the eve of the conference within AppsForGhent, allows individuals with a basic education in coding, IT or GIS to access and process satellite images to visualise on maps specific features of the land and their changes over time. Among the products of this Service, the Urban Atlas allows, for example, to visualise riparian zones and imperviousness in Ghent. Such information is useful to foresee and prevent the consequences of heavy rains or a flood on the city’s drainage system. Another example of application of the service is a map of the green areas within and around the city. Indeed, the Service has been used to monitor Natura 2000 sites since several years. The portal also generates analytics which can be extremely useful to city managers, such as: the total surface of the green urban areas, or the level of accessibility to green areas or to public transport in different neighbourhoods. According to Mr Forslund, “*The challenge today is to move towards smarter systems for accessing the data*”.

## Earth observation for cities: the Flemish perspective

This session, moderated by **Bart Rosseau** from the **Data and Information Office** of the **City of Ghent**, included the participation of two key actors in the fields of spatial management and innovation in Flanders, VITO and Information Flanders.

**Steven Krekels**, Unit Manager at VITO Remote Sensing, opened the session with a presentation on “Sustainable.Digital.Smart.Cities ... and Space” ([LINK](#)). VITO is a research organisation working closely with public and private actors to provide solutions in the areas of clean-tech and sustainable development. Mr Krekels opened his intervention by stressing the importance of using the satellite-based maps showed in previous presentations in concrete, tangible ways in European cities. According to him, many satellite-based services which have passed the R&D phase have not yet entered the market and would need more support from governments to be put to use. Krekel identifies three main technology trends: increasing computing power, access to data and use of artificial intelligence. These trends might lead to a future in which we will no longer own things, but only profit from services. Satellite data have a role to play in this shift. They are becoming, if not cheap, increasingly accessible (some are even available for free), while the quality of the images has remarkably improved. Earth observation data allows for objective measurements. Hence, it can be objectified and analysed. Combined with other data sources, satellite data can enable the services of a sustainable future society. The Terrascope platform — operational as of April 2018 — aims at being the portal to the Copernicus data for Belgium and at providing data that business can use. It offers access to up-to-date maps and data on greenness, soil moisture and air and water quality, among others, allowing for change detection and object recognition, and even generating economic indices. The Terrascope platform was the object of a dedicated lesson delivered by Jorgen Everaerts within the Master class organised on the eve of the conference within Apps For Ghent.

**Jo Van Valckenborgh**, Programme Manager of the Image Processing Chain for Flanders at **Information Flanders**, presented “The Image Processing Chain for Flanders” ([LINK](#)). Information Flanders is the agency in charge of developing a coherent, government-wide information policy to make the Government of Flanders an information-driven administration. Mr Van Valckenborgh highlighted the great availability of remote sensing resources, the increasing spatial and temporal resolution of satellite data, and the number of available combinations of platforms and sensors to capture the data. At the local and regional levels, such data are used for 3D mapping of cities and utility lines, for detecting archaeological sites, for modelling and monitoring of floods, and for mapping pollution and noise, among others.

[The Image Processing Chain](#) is a portal developed with the support of VITO, which gathers and makes available remote sensing data on Flanders. The portal also offers on-demand processing of the data into new geographical information and is part of [Flanders Radically Digital](#), an online database of digital information on the whole Flemish public administration. Mr Van Valckenborgh showed how to download data from the Image Processing Chain and how to visualise 3D data on cities’ infrastructure and green areas. It also gave an example of a processing service to automatically detect changes in buildings.

Among the new products offered by this service, he mentioned the Solar Potential Map of Flanders. Its use was presented later in the afternoon by the Environment Department of the City of Ghent.

## User Session – Resilient Cities

This session presented the experience of city actors which use Earth observation data to improve cities' efficiency and their resilience to climate change.

The first speaker was **Lars Nørgård Holmegaard**, from **Lemvig Vand og Spildevand** (Denmark). His presentation focused on his experience “Using satellite imagery to optimise maintenance work of water and wastewater pipelines” ([LINK](#)). Lemvig Vand og Spildevand (100% owned by the Municipality of Lemvig) manages 575 km of waste-water pipelines and 580 km of drinking-water pipelines. Lemvig became interested in satellite imagery when they noticed that soil subsidence would cause pipes in Thyborøn to break faster than in the rest of the municipality (30 years as compared to 75 years). Thanks to a collaboration with the Danish Coastal Authority and the Danish Agency for Data Supply and Efficiency, Sentinel data were used to assess land movements in the area. The results documented a subsidence up to one centimetre per year in Thyborøn. Lemvig Vand og Spildevand is now able to better manage its assets and to position the pipes where they are expected to last longer. They are so satisfied with the results obtained so far, that they are now working to launch a pipes modelling programme that would use Sentinel data to visualise their position dynamically. This system would increase the pipes' lifetime of at least 10% and is expected to generate €500k of revenues per year. Furthermore, the company is now in a dialogue with the authorities in charge of road maintenance to use the same satellite-based data to monitor the effects of soil subsidence on regional roads.

The following presentation was delivered by **Annemarij Kooistra**, Program Director at the Department of Engineering of the **City of Amsterdam**, and by **Patrick Stoppelman**, Director of Client Relations at **SkyGeo** (The Netherlands). They showcased their experience of use of “Earth Observation data for bridge asset management” ([LINK](#)). Mr Stoppelman introduced the audience to the nature and possible uses of InSAR data, providing information on soil deformation with millimetre accuracy. This data can be used, among others, to predict the impact of underground works on buildings, to determine the life-expectancy of roads, and to monitor the effects of groundwater extraction on monuments. In Amsterdam, SkyGeo supports the Department of Engineering in monitoring bridges and historical buildings. Amsterdam has 1 600 bridges and 500km of quay walls. Traffic in Amsterdam has a heavy impact on bridges, while buildings and quay walls can be damaged during reconstruction works. To monitor the structural integrity of such assets, satellite imagery was used to assess soil deformation and its impacts on the infrastructure. So far, the assessment has been performed on 100 bridges, and has been then validated with field measurements. InSAR data have also been used to assess the status of the buildings along quay walls, in order to prevent damages to their integrity during reconstruction works. The city uses such information to prioritise maintenance works, hence saving a considerable amount of time and resources for field measurements.

The last presentation of the session was given by **Dirk Voets**, from **Imagem**, who presented the experiences of “Usage of satellite imagery to enhance resilience in the cities of Almere and Nijmegen” (The Netherlands, [LINK](#)). Almere and Nijmegen are two middle-sized cities. The first is built

on the sea, and is affected by ground displacement, causing a lift in the soil pavement. In Nijmegen, extreme weather shifts cause frequent flooding. These problems are expected to increase due to climate change and the obsolescence of the infrastructure. For both cities, Igem provided a web-based monitoring system relying on satellite imagery to assess soil changes. The system enables the municipalities to monitor soil movements automatically and to prioritise maintenance works accordingly, thus limiting the need for field inspections. Considering that the cost of ground deformation in The Netherlands is estimated at €850M per year until 2050, the use of EO could provide precious information to public managers to both monitor soil movements and mitigate their effects.

## The European Innovation Partnership on smart cities and communities

The second half of the day was opened by **Bart De Lathouwer**, Director Innovation Programme and General Manager at the **Open Geospatial Consortium (OGC)**. On Behalf of Mr Svetoslav Mihaylov, from the Smart Cities and Sustainability Unit of the European Commission's DG CONNECT, Mr. De Lathouwer presented the "European Innovation Partnership on Smart Cities and Communities EIP-SCC" ([LINK](#)). The EIP-SCC aims at fostering collaboration among cities to develop integrated solutions in the fields of energy, transport and ICTs. Six Action Clusters work specifically on smart cities.

In 2015, the EIP implemented a Survey among 28 cities: 75% of respondents did not have an Urban Platform, and reported a lack of knowledge on their landscape, poor coordination among different city services and budgetary constraints. The EIP-SCC urban platform initiative aims at enabling cities to make sense of their data, to use them to become more efficient and to foster local innovation. The initiative is not an isolated effort, but is supported by several other initiatives, such as the Horizon 2020 ESPRESSO project (which will create a conceptual Smart City information framework based on open standards) and SAREF (Smart Appliances REFERENCE), which aims at building a "common language" to connect home appliances with energy management systems.

The EIP-SCC is joining forces with EURISY on the Space for Cities initiative. Within the initiative, two [surveys](#) have been launched: the first is addressed to public administrations, SMEs and NGOs already using satellite navigation, communication, and imagery in cities; the latter targets public entities, SMEs and NGOs operating in cities who do not use satellite applications yet, but are interested in them. The results of both surveys will provide feedback to decision makers and service providers on cities' needs and difficulties, and support city actors using or interested in using satellite applications.

## Elevator pitches: satellite-based services for healthy cities

During the event, six SMEs presented their activities in thematic elevator pitches: one dedicated to satellite-based services for healthy cities and one to satellite-based services for efficient cities. The first three solutions presented aimed at monitoring pollution and air quality.

**Nicolas Beaugendre** from **KERMAP** (France) presented an online platform, based on satellite remote sensing, to visualise urban vegetation in various cities worldwide ([LINK](#)). The platform will offer some basic information for free and some premium analysis for urban planners through paying services. Such tools aim at supporting urban planners to monitor some environmental indexes (such as biodiversity,

well-being and land consumption, among others), and to model trees' shadow and the effects of urban heat islands. In the city of Rennes (France), these services will help the local administration to monitor the evolution of the vegetation in different areas, to estimate the carbon storage, the increase of house units to the detriment of green areas, and climate change issues. The information on the vegetation cover will also support the preparation of the city's Local Plan of Urbanism (PLU).

**Jurgen Everaerts** from **VITO Remote Sensing** (Belgium) presented the BUMBA project, funded by BELSPO under its STEREO programme. The project used APEX, an airborne hyperspectral camera to derive a high-resolution map of concentrations of nitrogen dioxide in Belgium ([LINK](#)). Such information can be extremely useful to city managers, who can use it to spot the areas more affected by pollution and adopt preventive and mitigating measures. Sentinel-5P will provide daily updates, albeit at a lower spatial resolution.

**Ides Bauwens** from **Nazka Mapps** (Belgium) presented Aircheckr, a pilot project to gathers near real-time air quality data for cities ([LINK](#)). Mr Bauwens stressed that 90% of the world population is affected by air pollution, causing 467 000 deaths per year in Europe. Air quality is today considered as a concern both by public administrations and civil society. Information on air quality is today increasingly available to governments. Aircheckr produces real-time AQ data at the street level based on official and validated data derived from satellite imagery and sensors on the ground. Private and public city actors can access such data through an Application Programming Interface and do their own research and development, or use pre-designed widgets to inform citizens. Aircheckr was developed within the ESA Business Applications Programme.

## User Session- Clean Cities

After the first elevator pitch, the floor turned to the second user session on clean cities.

The first speaker, **Nicolas Lebert**, Intelligent Networks Project Manager at **Hespul** (France), described their "Use of satellite imagery to enable the energy transition in cities" ([LINK](#)). The French non-profit association aims at contributing to the advent of an efficient society based on renewable energies and on the values of equity and public interest. Within different EU-funded projects, such as Concerto in Lyon Confluence or City-zen in Grenoble, Hespul is making use of satellite data to support PV integration in cities. In Lyon, Hespul helped the municipality building a PV park on the rooftops of an ecological neighbourhood. Historical satellite imagery allowed them to predict the potential output of each PV system. In Grenoble, Earth observation data were used to size the battery of a building with PV panels installed for self-consumption. Once the plants are built, Hespul also supports owners to ensure their correct functioning. To do that, in 2009 Hespul created "Epices Energie", a company providing an online platform to monitor renewable energy production (including photovoltaic, wind and hydro energy). The added-value of the platform is that it allows cities to monitor a large group of technically non-homogenous production systems, and to automatically detect faults. If the actual output of a panels is lower than its expected output (computed with satellite irradiation data), an alarm is sent to the user. By reducing the cost of regular field visits, Lyon Confluence was able to reduce the cost of monitoring PV systems by 50%.



The last experience presented within this session on “Uses of the solar potential map for Flanders in Ghent” ([LINK](#)), was delivered **Jeroen Mercy** from the **Environmental Department of the City of Ghent**, accompanied by **Jo Van Valckenborgh** from **Information Flanders**. The City of Ghent is today fostering the renewal of public and private buildings. The website of the Municipality allows residents to assess the energy consumption of each buildings and its solar potential. To do this, the city integrates data provided by the Solar Potential Map of Flanders, an initiative jointly implemented by Information Flanders and VITO.

Remote sensing data, and in particular airborne LiDAR data, offers important information on two of the elements needed to build a solar potential map: solar irradiance per region and atmospheric conditions. The solar potential map for Flanders offers pre-processed information displayed on a web map. According to the colour of the buildings, users can know if the roof is ideal, usable, or of limited or no use for the installation of solar panels or a solar boiler. The map also shows the estimated cost to install and repair PV panels, the estimated number of PV panels needed, according to the average family energy consumption, and the estimated annual savings (in terms of energy costs and CO2 emissions). This information is offered for free to the residents of Ghent, who are hence able to autonomously estimate the convenience of installing PV panels on their rooftops.

## ESA Business Applications: how to improve cities with combined resources of space at your fingertips

The second part of the afternoon was opened by **Nicolas Helssen**, representing the **European Space Agency (ESA) Business Applications Ambassador Platform for Belgium**, with a presentation on how to improve cities with the combined resources of space ([LINK](#)). ESA's Business Incubation Centres (BICs) aim at fostering the use of existing space capabilities by supporting small businesses downstream. The incubated start-ups and SMEs receive support to develop products including the use of satellite applications. If the products proposed meet a consistent user demand, the start-ups are guided through a feasibility study and a demo, leading to the implementation of an operational service.

Among the projects implemented within the Belgian BICs, Nostalgeo (developed by Nazka Mapps) offers a location-based platform to document street-views from the past. The Belgian ESA BICS are particularly interested in solutions aimed at improving the management of critical infrastructures in cities. As an example, Katoum (developed by Eurosense) uses Earth observation data and satellite navigation signals to enable a warning system for ground deformation in karst areas.

The first two quarters of 2018 focus on industry 4.0, ecosystems, social inclusion and the Atlantic area. During the third quarter of 2018, the Business Applications Platform will launch a call to fund projects up to €250k focusing on critical infrastructures. These will be 100% funded by the programme. The Key Focus Areas will be: smart infrastructures, urban planning, city analytics, sustainable cities, smart security, smart utilities, and big data analytics.

## Elevator pitches: satellite-based services for efficient cities

Before the conclusive interactive discussion, a new elevator pitch presented three more projects/initiatives. **Matthias Piens**, from **Eurosense** (Belgium) focused on the uses of remote sensing to assess light pollution in European cities ([LINK](#)). The company participated to the EC-funded project “DECUMANUS” (DEvelopment and Consolidation of geo-spatial sUstainability services for adaptation of environmental and cliMAte change Urban impactS). The project profited from different data sources based on satellites: satellite-based heat loss maps (750m resolution), satellite-based light maps (375m resolution), International Space Station light photography (30m resolution), and photovoltaic potential maps (0.5m resolution).

Within the project, emphasis was placed on light pollution, a phenomenon that has negative effects on ecosystems and peoples’ health. Using satellite and aerial imagery, project partners were able to develop a service for city managers to classify light emissions, detect the areas producing too much light pollution in cities, and assess the impact of lighting plans on the surrounding areas.

**Damien Closson**, from **GIM NV** (Belgium) underlined the importance of telecommunications to truly create smart cities ([LINK](#)). In the context of mobile radio communication systems, “RF Planning” is the process of assigning frequencies, transmitter locations and parameters of a wireless communications system to provide sufficient coverage and capacity for the services required. Telecom operators need information on signal strength in specific spots, on unwanted echoes, or on the number of stations required to grant the signal in certain locations. The “RF plan” of a cellular communication system has two objectives: coverage and capacity. To meet the objectives, telecom operators need detailed land cover data and information on elevation, height and nature of the objects within a city.

The Belmap 3D database of Belgium includes 35 sources of paying and free-of-charge data that can be useful to optimise communication systems’ coverage and capacity. The database includes a big amount of data derived from satellite remote sensing, such as land covers, vegetation, inland waters, and buildings, among others. By using such data, GIM was able to create a 3D map of Belgium in eight weeks only. The map can be used by both private and public organisations to assess city’s features and to improve urban services.

The last pitch was delivered by **Bart De Lathouwer** from **OGC**, who presented the H2020 project NextGEOSS. This is a data hub allowing for access and exploitation of Earth Observation data, and includes user-friendly tools for data mining, discovery, access and exploitation ([LINK](#)). The project, to be implemented in 2016 - 2020, includes 27 partners from 13 countries. The project is based on a “User Feedback Mechanism”, enabling users to efficiently deliver and find fit-for-purpose GEOSS data and information, and on “Advanced Discovery Tools”, which allow for increased discoverability of Earth observations and related information for thematic areas.

The system is innovative since it does not require users to download huge datasets, but to save and process them directly in the cloud. The NextGEOSS approach and methodology are open, inclusive and agile. These characteristics are aligned with the EU openness policies and the GEO open data sharing principles.

## Interactive discussion: ideas and opportunities to use earth observation data to increase quality of life in cities

An interactive discussion aimed at exchanging on the relevance of the satellite-based solutions presented to the needs of cities and regions closed the conference. The discussion saw the active participation of: **Federica Bordelot**, Policy Advisor at Eurocities, **Nathalie Dumarey**, Smart City Manager at the Association of Flemish Cities and Municipalities, **Djida Bounazef-Vanmarsenille**, PhD in Business Management at the Smart City Institute HEC of Liege, **Ilaria D'Auria**, Communication and Project Manager at the Network of European Regions Using Space Technologies – NEREUS, and **Ingrid Reynart**, Business Group Leader Smart City at Agoria.

Before entering into the core part of the discussion, each of the participants made a small presentation. Mrs. **Bordelot** presented the initiatives, projects, and activities dedicated to smart and sustainable cities developed under the umbrella of Eurocities ([LINK](#)). **Nathalie Dumarey** introduced the activities conducted by the Association of Flemish Cities and Municipalities, also developed in the frame of the United Nations Sustainable Development Goals ([LINK](#)). Ms. **Bounazef** showed the results of the Belgian Barometer and of an ad hoc Barometer for smart cities in Wallonia, based on a quantitative research on 58 Walloon Municipalities ([LINK](#)). Ms. **D'Auria** presented the role of NEREUS and the importance of regions active in the space domain, underlining the existence of a new political interest for innovation and technology as tools to contribute to economic and social development ([LINK](#)). Ms. **Reynaert** concluded the presentations round describing the activities of Agoria Belgium and the role of the Smart Cities Committee. The Committee is active in four domains, offering a market neutral platform and new business, financial and procurement models for big companies, SMEs and start-ups that are willing to deliver dedicated services for cities ([LINK](#)).

The final exchanges highlighted that technology and **innovation** are being recognised as key elements for future policy initiatives throughout the public sector, whilst being seen as relevant tools to boost the economic development at any level. At the same time, speakers underlined the **lack of knowledge** within city authorities on the use of satellite technologies, as well as a gap in ICT skills.

**Civil society** stakeholders have also been recognised as vital actors to foster cultural and societal changes. Indeed, they can assume an important role in the exchange of good practices to inspire local authorities in pursuing their projects. Ms Dumarey stressed that small and big cities often face similar challenges, while Ms Bordelot underlined the need to not only promote the exchange of successful good practices, but also to encourage exchanges on their challenges, and advance discussions on possible solutions. Ideally, such discussions should lead to the development of satellite-based solutions that are scalable and can be adapted to the needs of public managers working on different administrative levels. According to participants, it is fundamental to help small cities with innovative visions and encourage them to push forward their ideas. Much knowledge can be acquired by sharing both successful and unsuccessful stories. Last but not least, cross and inter-sector cooperation, as well as the need to build on existing tools, have been equally emphasised within the panel.