CREATING VALUE FOR EUROPE

Space activities and capabilities significantly contribute to Europe's leadership in science, technology and innovation, and support Europe's economy and society towards more responsibility, resilience and autonomy.

Space is integral and important in our daily lives. It provides crucial solutions and support for monitoring, early warning, and emergency response in case of catastrophic events. Space inspires, protects future generations and shapes our economic growth.

ESA has measured the socio-economic impact of its activities since the nineties, drawing on experience from Member States and international bodies such as the OECD. Robust and standardised methodologies offer consistent measures of the impacts of ESA programmes. At the ESA Council Meeting at ministerial level, CM22, 14 independent socio-economic studies will support critical decisions while providing evidence of the value generated by space in Europe.

Space infrastructure and its applications deliver **strategic**, **societal** and **economic** benefits to European citizens. These will play a crucial role in supporting Europe in overcoming the challenges it faces. Continuous public investment in space will remain essential to ensure sustainability and to prevent the loss of R&D capabilities and critical skills that safeguard and strengthen Europe's sovereignty.

SPACE TO TACKLE UNPRECEDENTED CHALLENGES

As urged by the Organisation for Economic Co-Operation and Development (OECD), continuous public investment in innovation, science and technology is essential in times of crisis to support a sustainable economy and society and to prevent the loss of R&D capabilities and critical skills that safeguard and strengthen sovereignty.

AMBITION

STRATEGIC IMPACTS

Space supports Europe's competitiveness and autonomy

Space investment fosters European leadership and secures Europe's autonomy in critical areas such as access to space, utilisation of space and space safety. Programmes which increase European market share, give access to new markets, or create a first-mover advantage, increase **European competitiveness**. Programmes which develop new, or sustain, critical European capabilities increase **Europe's non dependence**.

Identifying and developing promising cutting-edge technologies helps new missions to flourish and are vital for Europe's autonomy. The 2022 European Space Technology Harmonisation agreement will help all stakeholders to work together towards a common goal to avoid duplication of effort or gaps.

Industry leaders aim to use this method to develop technologies for automation and robotics, for example, enabling the European space industry to tap into a market with a potential value close to €6 billion across the next decade (2021–30).

Maintaining autonomous and independent access to space is essential for Europe to use space exploration, space science, and space applications for the wider benefit of society. Developing Europe's own human space transportation capabilities would enable European space industry to capture a new market share estimated to be worth several billion euros across the period 2028–40.

ESOC, Europe's centre for satellite operations, provides European organisations with independent access to ground segment systems, leading capabilities and knowhow. It meets the operational needs of Europe's space missions for planetary science, Earth observation, astronomy and fundamental physics, exploration, and space safety – all of which are critical to Europe's autonomy and leadership.

For example, the space weather 'smallsat' fleet proposed at CM22 would improve satellite reliability by a factor of five, cost efficiency by a factor of three, and data latency by a factor of eight, leading to a significant boost in European industrial capacities and competitiveness in the global market.

Unique technology development for ESA science missions leads to critical technological non-dependence for Europe. AQUILA is the first European radiation-hardened high-accuracy accelerometer for space use. It provides a European navigation solution for upcoming missions and for enhanced applications for marine, land and aviation use. The project enabled the development of highly-specialised space technology, built a new European champion and increased European non-dependence for a critical technology.

ECONOMIC IMPACTS

Space supports Europe's economic growth and employment

ESA's activities create economic value in Europe's space industry and overall economy. An important indicator to track this is gross value added (GVA) which measures the contribution of ESA's programmes to the European GDP.

The FutureEO programme is a vital first step to deliver socio-economic benefits from Earth observation. FutureEO activities proposed at CM22 could generate up to €3.2 billion in GVA in the period 2023–30.

Terrae Novae leads Europe's human journey into the Solar System, returning the benefits of exploration back to society. The next period of the programme proposed at CM22 could generate more than €2.8 billion in GVA and €800 million from taxes in Europe during 2023–30.

The ARTES programme makes ESA the most significant public investor in space-based telecommunications in Europe today. During 2018–21, every €1 million invested in the programme generated €3.4 million in sales for Europe's space industry.

Developing mission operations infrastructure enables autonomy and the mutual exchange of spaceflight services and expertise, fostering economic growth and employment. During 2019–21, these activities supported more than 3600 jobs annually in Europe.

The NAVISP programme has supported industry in generating sales of €120 million from new businesses proposing innovative Positioning, Navigation and Timing (PNT) solutions in a wide range of economic sectors.

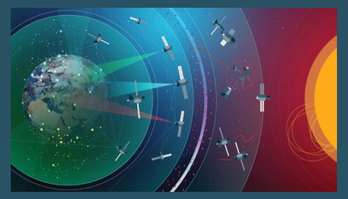
SOCIETAL IMPACTS

Space supports Europe's increased responsibility and sustainability

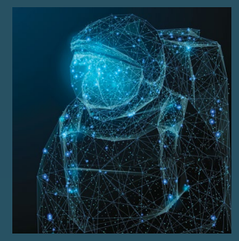
Space contributes to solving global challenges such as climate change; to scientific discovery; to protecting our planet, humanity and assets in space; and to inspiring and encouraging the next generations towards STEM education.

Copernicus is the largest world-class provider of free space data and information. Public authorities use this data to make informed decisions, improve awareness, enforce environmental policies, and build a more sustainable and responsible European society. Copernicus is Europe's 'eyes on Earth', providing terabytes of data per day and helping to address an ever-increasing range of European ambitions and priorities.

The knowledge, technologies, and applications derived from science and exploration activities, like advanced life support systems, provide innovative and practical solutions in areas such as climate and carbon footprint, responsible consumption, resource management, and health care.



Space Safety activities provide services protecting critical infrastructure essential for Europe's safety and security as well as mitigating potential damages from catastrophic events. A near-Earth object (NEO) colliding with Earth could cause damage estimated from **€3.8 billion** for a 50m NEO to **€3.2 trillion** for a 1km NEO. One single extreme space weather event caused by our active Sun was estimated to cause potential socio-economic damages of up to **€15 billion.**



ESA makes world-class achievements in space science and exploration happen. Research and scientific output produced from mission data feeds innovation, develops a highly skilled workforce in Europe and inspires the next generation of talented STEM professionals.

Science and exploration activities inspire the public. It's no wonder that more than 22 000 people from across Europe applied to ESA's 2022 astronaut selection. In November 2014, more than 10 million people followed the Philae landing on a comet on television and the internet as part of the Rosetta mission.

Case study: Helping Amsterdam become fully circular by 2050

The application of ESA's MELiSSA technologies, initially triggered by the long-term needs for human missions to the Moon and Mars, was investigated to recover nutrients and clean wastewater for use in vertical farming in The Netherlands. It was found that, if implemented, the technology could lead to a recovery of 80-90% of wastewater as irrigation water for food production, supporting an average 2kg of vegetables per person per day.

The city of Amsterdam estimates such treatments could lead to an added economic value of €150 million/year over the next 5–7 years, the creation of 1200 jobs and a reduction of 600 000 tonnes of CO2 – 3% of the total CO2 emissions of the city – thanks to the high-quality recycling of organic residual streams.

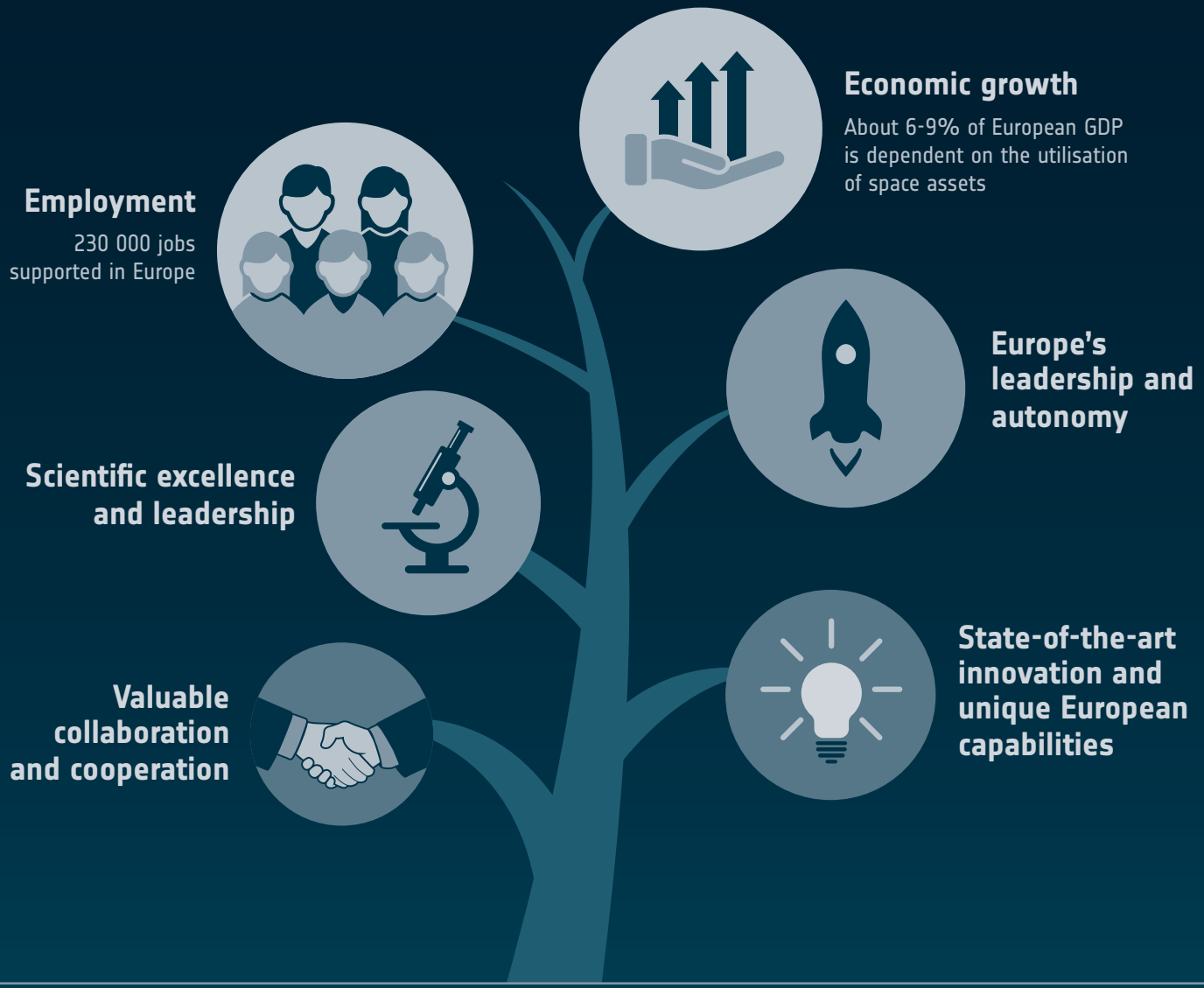
Already today, cities consume 75% of the natural resources, produce 50% of the global waste, and emit 60-80% of the greenhouse gases. By 2050, two thirds of the population will live in cities around the world.

AMBITIOUS SPACE FOR EUROPE'S SOCIETY AND ECONOMY

ESA programmes address some of the greatest challenges of humankind. They make a fundamental contribution to building leadership, responsibility and autonomy in Europe.

Sustained investment in the programmes of the Agency will be essential to ensure that Europe and its citizens benefit from the full value of space.

Safety and quality of life for Europe's society



0.05% of European GDP spent in space activities

Further information, publications and material on ESA socio-economic studies can be found on ESA's Space Economy website at space-economy.esa.int