DIGITAL CITIES CHALLENGE

Digital Transformation Strategy for the city of Sofia (DTSS)

A platform for smart growth

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Digital Cities Challenge

Digital Transformation Strategy for the city of Sofia: A platform for smart growth

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Table of contents

Executive Summary: Sofia's digital transformation 4

1. Introduction to the Digital Cities Challenge 9

2. Overview of the digital maturity assessment for Sofia 11

3. Mission and Ambition statements 13

4. A platform for smart growth: the Digital Transformation Strategy for the city of Sofia 16

4.1. Strategy orientation 16

4.2. Operational objectives 21

5. Digital strategy roadmap and planned activities 26

5.1. Overview of proposed activities 26

5.2. The pilot activities: Digital and physical space for start-ups located in Sofia, Promotion of Sofia as a risk investment destination, Online platform for services in schools 31

5.3. Timetable for implementation 32

6. Strategy governance 34

7. Monitoring and evaluation of the Digital Transformation Strategy 40

7.1. Performance assessment framework 40

7.2. Strategy evaluation plan 40

8. Results achieved and next steps 42

Appendix I: Detailed presentation of activities 43

Appendix II: Performance assessment framework 54

Appendix III: Relevant Good practices 67

Appendix IV: Bibliography 69

Appendix V: Stakeholders consulted 70

Executive Summary: Sofia's digital transformation

Sofia a central node in the Digital Cities Challenge network

The Digital Cities Challenge, an initiative of the European Commission, helps to achieve sustainable economic growth in Sofia through the integration of advanced technologies. The initiative fosters complementarities and synergies between existing policies involving digital priorities (e.g. smart specialisation, digital city, e-government) and the newly planned policy actions supporting digital transformation.

The ambition is that Sofia will act as model for other Bulgarian and European cities. By developing and testing novel policy levers in a collaborative approach with the involvement of other cities as peers it will demonstrate how to reap the benefits offered by the transformative power of digitisation. It will showcase how to fill the gaps which are currently hindering Sofia to advance and capture the benefits of digital transformation.

The digital transformation strategy for Sofia: *A platform for smart growth*

The mission and vision statements for the digital transformation of Sofia are the main output of the first step of the digital transformation strategy. They are based on the results of self-assessment by stakeholders; the collection of Key Performance Indicators; a literature review of current strategy and policy documents; assessment visits and interviews with 17 stakeholders, in March 28-30, 2018; and a vision and ambition workshop with the participation of 13 stakeholders, on May 9, 2018. The digital transformation of the city of Sofia focuses on the local ICT ecosystem. This is a clear priority set by the local government and the Sofia Investment Agency that leads the Digital Cities Challenge. The digital transformation of this business ecosystem presupposes the convergence of three conditions: (1) the supply of needed digital services by the ICT companies of Sofia, (2) the demand for such services by other industries located in the city, utility services providers, and government, and (3) an effective system of innovation to support with skills and funding the digital transformation of the local economy.

On this basis, the city of Sofia has defined the following mission:

"Mission statement"

The mission of the Digital Transformation Strategy for Sofia (DTSS) is to define and elaborate an action plan and a series of actions that strengthen the ICT business ecosystem located in Sofia, enabling (a) to develop innovative solutions for the digital transformation of the city; (b) to create new markets for digital products and services at local, national or global level, and facilitate the access to these markets; and (c) to support the system of innovation (local or national) for the development and absorption of new digital services and solutions.

In order to reach this goal, the DTSS will pursue the following ambitions:

- To enable most companies in the ICT business ecosystem of Sofia to engage in the digital transformation of the city by developing and offering innovative products and e-services. This may be achieved by enhancing the capability of ICT companies for making products and services suitable for the digital transformation of the city; moving ICT companies upstream from outsourcing to higher added-value services; using hackathons and competitions as a way for developing new products and e-services; and developing e-services based on open data.
- To create markets for ICT products and e-services at local and national levels, by selecting and facilitating the access of ICT companies (small and large) to other industries, the public administration, and utility organisations. This may be achieved by opening the public market for digital services; promoting the standardisation of e-government services across administration departments and cities of Bulgaria; increasing the awareness and inform ICT companies about digital services and solutions to be deployed by local and central governments; creating markets for digital services by utility providers (water, waste, energy); creating markets for digital services in transportation service providers; and increasing the awareness about the benefits of the digital transformation in utility, transportation, and government services.
- To enhance the local innovation ecosystem by funding mechanisms, information services, and brokerage agents, facilitating the digital transformation of the local economy, and enhance the skills of the local ICT labour market and the start-up ecosystem to support the digital transformation. This may be achieved by providing training and skills in data science and analytics, mathematics, AI and deep learning, algorithms for optimisation, software programming and software engineering; and limiting the separation between digital and non-digital skills, advancing interdisciplinary training between ICT, business, and engineering.

The roll-out of this strategy will be guided by the implementation of 18 operational objectives:

- **To develop the research and innovation capacity of ICT companies** to design and develop new applications and smart solutions for the digital transformation of the local economy.
- **E government market:** To develop e-services in the areas of current services provision by the municipality (in order of hierarchy): (1) administration services, (2) primary education, (3) culture and tourism, (4) city planning and construction control, social care, green systems and forestry, local taxes and payments.
- To **improve e-skills** (1) internal in the public administration to use and manage platforms for e-services, (2) external in the city population to use e-services and online forms.
- To **transform internal processes and break-down silos in the public administration** related to the provision of e-services.
- To offer **open datasets** of the public administration and create datasets in collaboration with city stakeholders.
- To develop **e-services** in areas such as: (1) energy and water saving, (2) optimisation of public lighting, (3) smart metering, (4) environmental monitoring, (5) demand prediction, (6) identification of water leakage and energy loss incidents.
- To **change the mindset** of (1) the public administration, (2) customers and users, in adopting smart meters and sensor-based solutions for optimisation and (3) adopt behaviour for energy / water saving.
- Develop the **interconnection of physical and digital infrastructures.**
- To develop **flexible and adapted business models for e-utilities.**
- To **develop e-services for transport** / green mobility in areas such as: (1) traffic flow monitoring in real time, (2) traffic emissions monitoring, (3) parking in the city, (4) usage of vehicles, (5) mobility as a service, (6) ticketing, (7) micro-logistics in the city, (8) user satisfaction from public transport.
- To create a **platform enabling the integration of all software solutions, data, service providers, and communities active in the sector of urban transportation** (public operators, taxis, sharing and pooling of any transportation means, and other

- To develop **platforms for car-pooling and car-sharing** that reduce car ownership and individual use of vehicles that have a public and non-profit character.
- To apply **flexible pricing models, based on data to encourage the use of public transport.**
- To establish **new mechanisms for incubation and financing** (particularly early stage).
- To develop **e-platforms that connect start-ups to markets and governments.**
- To **offer university education and technology skill in STEM, interdisciplinary engineering and informatics, and entrepreneurship.**
- To encourage **international funds for risk capital to locate in Sofia.**

The strategy roadmap for the city of Sofia

The city has identified the list of activities to be implemented in the short, medium and long terms, in order to make its strategic mission and ambition a tangible reality. As such, a total of 14 specific activities have been identified, under the different operational objectives of the strategy. Examples of key activities to be implemented as part of the strategy include: Distributed platform of urban data, Integrated tariffs and common charging model across mobile services, Dashboard for real-time utilities consumption. Digital and physical space for startups located in Sofia, Promotion of Sofia as a risk investment destination, and Online platform for services in schools have been identified by the local working group as the pilot activities for immediate implementation, in order to launch the implementation phase of the digital transformation strategy and start generating immediate results.

The outlines of the **governance of the digital transformation strategy** have also been defined:

- **Strategy ownership** – Governance of the DTSS will follow a participatory governance model, based on the alliance of many stakeholders from the public, community, and private sectors and relevant to the domains of the DTSS, namely, startup ecosystem, government, utilities and transport.
- **Strategy steering and oversight – DTSS** – Sofia Investment Agency, in collaboration with Advisory boards consisting of organisations like political, administrative, and (private) external organisational formations that facilitate the interaction among stakeholders or allow for certain processes will assure the follow-up, implementation

and assessment of the DTSS. The composition of the advisory boards, and the decision-making process are the starting point of the DTSS implementation.

- **Strategy implementing agents** – In the area of e-Government the Mayor/Sofia Municipal Council should consider establishing an **Office of the Chief Data Officer (OCDO)**, led by a newly appointed **Chief Data Officer**, a director-level position that will have the executive authority to establish a system for data management and the policies and practices that ensure data is collected, stored, analysed and shared consistently across the municipality and collaborating organisations. The Mayor/Sofia Municipal Council should also consider establishing **Sofia Digital Agency (SDA)**. SDA can take over the functions related to the DTSS implementation monitoring as well as facilitate the long-term digital transformation of Sofia through identifying new opportunities for digital/smart city projects and working towards their implementation.

Last but not least, a **performance framework for the strategy** has also been designed in light of conducting regular monitoring and appraisal of strategy implementation.

1. Introduction to the Digital Cities Challenge

According to recent data, 72% of the EU's population lives in cities, towns and suburbs, making them the engines of the continent's economy. Cities generate 85% of Europe's GDP, they also face multiple, interconnected challenges, including energy and climate change, employment, migration, social inequality, and water, air and soil pollution.

However, through advanced digital technologies, Europe has the opportunity to re-invent the way we manage our cities' development and respond to the big societal challenges, such as efficient health management, cleaner environment, green mobility, and offering great-value jobs. Due to their high density, cities are put in a very good position to create innovative ecosystems made up of a wide array of different stakeholders from government, industry, finance, academia, communitarian organisations, social partners, etc. Cities have the capacity to make policies become reality.

In this context arises the **Digital Cities Challenge**, an initiative of the European Commission with the main purpose to support the cities in their path to digital transformation. DCC offers policy advice and support to 15 cities in Europe, namely **Alcoy, Algeciras** and **Granada** in Spain, **Arad** and **Iasi** in Romania, **L'Aquila** in Italy, **Kavala, Patras** and **Thessaloniki** in Greece, **Sofia** in Bulgaria, **Ventspils** in Latvia, **Grand-Orly Seine Bièvre** in France, **Pori** in Finland, **Rijeka** in Croatia, and **Guimarães** in Portugal. The support to be offered will speed up the digital transformation and the industrial modernisation of cities in order for them to take full advantage of the 4th industrial revolution.

This initiative draws inspiration on the recommendations set out in the "Blueprint for cities as launch pads for digital transformation". In addition, it will reinforce the networking among model

cities, facilitate their participation in on-going European initiatives in similar policy fields, strengthen stakeholder collaboration, cross-regional partnerships and stimulate investments.

The selected Digital Cities received support in the form of field advisory services provided by a group of high-level experts and peer reviewers, and offered the possibility for city representatives to participate in a series of capacity building and networking seminars. These activities took place in four Academy seminars during which cities shared practices, took advantage of peer to peer learning and worked together and in thematic groups on the steps of their digital transformation trajectory.

The commitment of Mayors is key to the success of fostering economic growth, increasing prosperity as well as well-being across European cities. The engagement of political leadership will be of much value to achieving digital transformation in European cities, providing strategic orientations and ensuring that the process of developing and operationalising the strategy supporting digital transformation is translated into a portfolio of relevant actions supporting each other towards achieving a common goal and tailored to the local context. Such efforts need coordination to ensure that effort and dedication undertaken by the city administration is directed to best effect.

As a result of this, the Digital Cities Challenge has directly engaged with the Mayor of the supported cities. In December 2018, the Mayors Conference was organised in Brussels to reflect upon the ongoing work and co-design the technological transformation trajectory of European cities.

This digital transformation strategy presented in this document has been developed in the framework of the field advisory services delivered in the Sofia. It represents the main output linked to the participation of the city in the Digital Cities Challenge. The strategy will be the main guiding document for the city to embark on its journey to unleash the power of digital transformation for growth and competitiveness.

2. Overview of the digital maturity assessment for Sofia

The initial overall assessment showed that Sofia stands at a mid- to low-level of digital maturity. In two out of the eight dimensions of the assessment, community and digital skills, Sofia is placed at mid-level of digital maturity. In the other six dimensions, related to open data, governance, support services, infrastructure, finance and digital competences the city is placed at low level of maturity. This overall assessment indicates an important margin for digital improvement to all dimensions of Sofia.

However, this assessment was not validated by the interviews and the vision and ambition workshop. The opinion of stakeholders was that the city of Sofia is strongly divided. The ICT ecosystem is very advanced and companies in this sector have high digital skills, technology competence, and competitiveness. Equally advanced is the start-up ecosystem and the digital infrastructure, which offers a good level of broadband connectivity. The low level of digital maturity characterises the other sectors of the local economy, both in manufacturing and services. Thus, the digital transformation of Sofia would have limited impact on the ICT firms, start-ups and broadband, if it is not directed to sectors that offer markets to ICT companies.

Figure 1 Strengths and Weaknesses

	Strengths	Weaknesses
Infrastructure	> Extended FTTH network at housing &businesses > Extended 4G network	> Very limited coverage of public spaces by Wi-Fi, around 100 hotspots in the entire city
Access to data	> No strengths in any domain of data access	> Low Open Data awareness and culture > A few Open Data repositories and data centres > Low public engagement and policy
Digital skillset	> Strong interest of young people in digital subjects > Additional education and training in digital skills are provided by the IT sector	> Digital skills in non-digital sectors are limited
Companies' digital competencies	> High use of digital processes in companies driven by senior management	> Limited awareness for industry 4.0 concepts > Limited access to local IT solution providers > Rather limited use of cybersecurity solutions and privacy measures by companies
Community	> Strong IT tech-community in the city > Frequent networking events for digital companies organised	> Low collaboration amongst digital and non-digital stakeholders > Low networking between digital and non-digital companies
Finance	> Strong business angels community providing equity capital to IT companies > Larger VC funds started operation	> Limited funding is available by banks in all areas of finance > Limited bank loans to digital companies. > Non-existent VC funding by banks
Support services	> No strengths in any domain of support services, apart incubators and accelerators	> Low offer of intermediary tech support such as innovation labs, accelerators, fablabs, citylabs, for digital and non-digital companies
Governance & leadership	> No particular strengths in any domain of gov and leadership	> Stakeholders do not share a common vision on digital development > No single authority for planning and implementation of a digital development plan

A separate assessment report has been produced for the city of Sofia, as part of the Digital Cities Challenge.

3. Mission and Ambition statements

The digital transformation of the city of Sofia focuses on the local ICT ecosystem. This is a clear priority set by the local government and the Sofia Investment Agency that leads the process of the Digital Cities Challenge.

The digital transformation of the ICT ecosystem presupposes the convergence of three conditions:

(a) Availability of broadband infrastructure, e-services, and digital city solutions offered by local ICT companies (***supply side precondition***).

(b) Identification and opening of information- and knowledge-intensive sectors of activity in Sofia, in which e-services and data-based optimisation could be absorbed and used (***demand side precondition***).

(c) Effective system of innovation capable to support the digital transformation of the local economy, utilities, and governance, by facilitating the developing and adoption of new services (***innovation network precondition***).

These three conditions should work in tandem. Without ICT providers, digital infrastructure and e-services the digital transformation is not feasible; without information and knowledge intensive sectors that use ICT services there is no recipient of digital services; without an effective innovation system, there is no opportunity for change either in the supply or the demand sides of the city.

Mission statement

The mission of the DTSS is to define an action plan and actions that strengthen the business ecosystem of the ICT sector located in Sofia, in order to (a) develop and offer solutions supporting the digital transformation of the city; (b) identify or create markets for digital services, at local, national or global levels, and facilitate the access to these markets; and (c) support the system of innovation (local or national) enabling the development and absorption of new digital services and smart solutions.

Ambition statements:

Data from the SAT, KPIs, published documents and data about innovation and ICT in Sofia, and the interviews with stakeholders from manufacturing, education, banking, and the public

administration, allow for identifying key areas of the vision and ambition for the digital transformation of Sofia. Thus, the vision and ambition statements can be stated as following:

1. **To enable most companies in the ICT business ecosystem of Sofia to engage in the digital transformation of the city by developing and offering innovative products and e-services**. In particular:
   - Enhancing the readiness and capability of ICT companies for making products and services suitable for the digital transformation of the city.
   - Providing e-services that facilitate the digital transformation of local industries and services in manufacturing, transportation, energy and water supply, and government.
   - Moving ICT companies upstream, from outsourcing to higher added-value services, offering own services instead of promoting those of global ICT providers.
   - Using hackathons and competitions as a way for developing new e-services.
   - Developing e-services based on open data and promote the creation of a Big Data Centre of Excellence.
2. **To open markets or create new markets for e-services at local and national levels, by supporting and facilitating the provision of e-services to industries, the public administration, and utility organisations.** In particular:
   - Opening the public market for e-services and smart solutions at local and national levels. Promote the standardisation of e-government services across administration departments and cities of Bulgaria.
   - Increase the awareness and inform ICT companies about digital services and solutions to be deployed by local and central governments.
   - Opening the market of e-services to be used by utility organisations (water, waste, energy) and increase the awareness of utility companies about the benefits of digital transformation.
   - Opening the market for digital services in transportation and the awareness about smart transportation and e-sharing mobility solutions that can be deployed locally.
   - Monitor and document the added value of using digital services in sectors of the local economy and in daily conditions of safety, the quality of the environment, and other.

3a. To enhance the local innovation ecosystem by funding mechanisms, investor networks and brokerage events, facilitating the digital transformation of the local economy. In particular:

- Providing funding for digital infrastructure, e-services and ICT start-ups.
- Increasing awareness about business models that can sustain the digital transformation of the city in the sectors of government, utilities, and transportation.
- Facilitate funding by increasing awareness and lowering innovation risks. Make universities more active in the start-up ecosystem.
- Providing business intelligence and awareness about products, e-services, and the market of digital solutions.
- Develop a public procurement that is friendly to the digital transformation of the city.

3b. To enhance the skills of the local ICT labour market and the start-up ecosystem for the creation of e-services and datasets by public and private organisations. In particular:

- Providing opportunities for training and business development open to all, over public infrastructure and open commons.
- Covering the needs of local ICT companies for skills in data science and analytics, mathematics, AI and deep learning, algorithms for optimisation, software programming and software engineering.
- Limit the fragmentation / separation between digital and non-digital skills and advance interdisciplinary training between ICT, business, and engineering.
- Open the infrastructure of the Sofia Technology Park to provide advanced training and experimentation over the Lab infrastructure available (e.g. cyber-security, rapid prototyping, 3D printing).
- Increase training on entrepreneurship and risk taking from an early age and education. Offer training in design thinking and innovation by design.

4. A platform for smart growth: the Digital Transformation Strategy for the city of Sofia

4.1. Strategy orientation

The Digital Transformation Strategy for the city of Sofia focuses on smart growth. It is a growth sustained by digital systems and concerns both the ecosystem of ICT companies located in Sofia and other industry and service sectors that absorb digital services. The strategy has been drafted in collaboration with stakeholders from private and public organisations of Sofia. Interviews and workshops with their participation took place in May and June 2018 and the Operational Objectives of the DCC strategy were defined in two successive workshops, held on 10 July and 10 September 2018.

This collaborative strategy design was also guided by three frameworks of reference:

- First, a group of theories on clusters, technology districts and other innovative agglomerations, which outline the factors that drive the growth of industry and service ecosystems. In cluster theory, for instance, clusters are shaped by the so-called 'diamond conditions', namely input and demand conditions, local environment of support industries, and firms' strategy and rivalry (Porter, 2011). In new industrial districts, which is the usual agglomeration form in electronics, media, pharmaceutical, aerospace and other high-tech industries, the most important growth drivers are (a) technology and continuous technological change, (b) agile organisations with extended transaction linkages, and (c) territorial industrial complexes with external economies of scale and scope (Storper, 1997). In the evolutionary economic geography theory, growth comes from branching, diversification and generation of new economic activity. It is a path dependent process based on knowledge and technological proximities (Boschma and Frenken, 2011). Relatedness of knowledge and related variety are beneficial for externalities in spillovers and start-ups, thus enhancing growth and employment.
- Second, the innovation policy space, which outlines the type of policy objectives and measures that sustain innovation and transformation of industries. These may include

R&D grants and R&D infrastructure, innovation grants and equity finance, open innovation and crowdsourcing, innovation infrastructure and advisory services, and collaboration networks and systemic policies (Cirera and Maloney, 2017).

- Third, the JRC scenario building and assessment methodology, that is based on the identification of focal issue, definition of drivers, ranking by importance and uncertainty, and selecting best scenario for growth with respect to ranking of drivers (JRC, na).

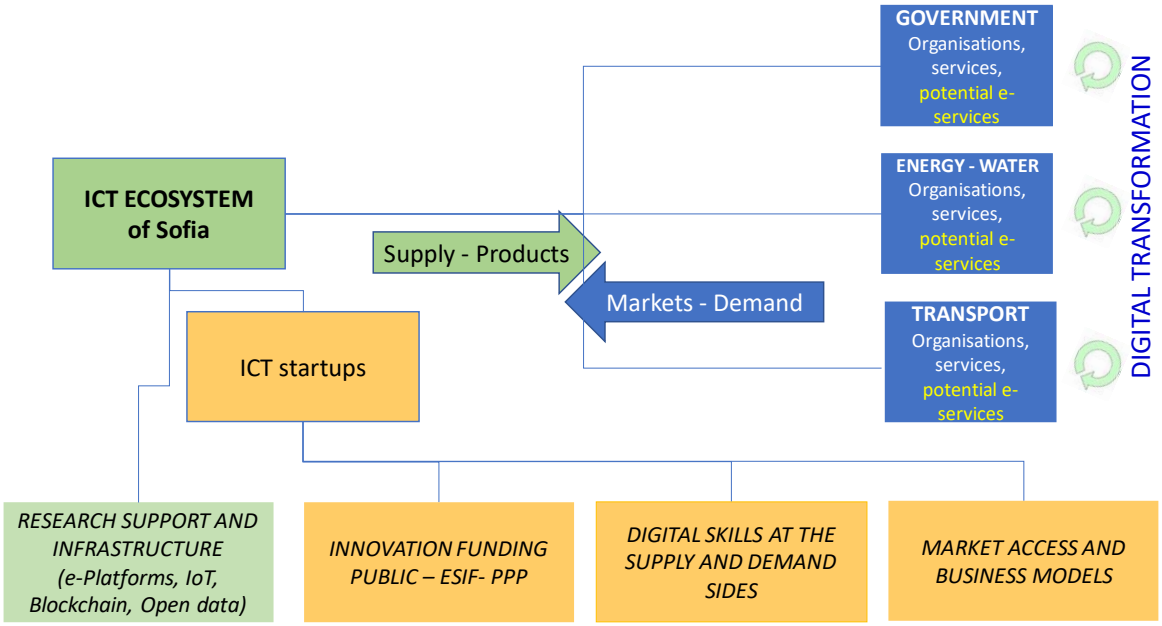
The digital dimension of the Smart Specialisation Strategy of Sofia has also provided insights for operational objectives. In Bulgaria, the S3 strategy has been elaborated at national level. However, a regional component, the Innovation Strategy for Smart Specialisation of Sofia (ISSS of Sofia) was adopted by the Sofia Municipal Council in January 2016.

Box 1 The links to other existing strategies at the city level

The ISSS of Sofia aims at adapting the national specialisation strategy of Bulgaria, which has been drafted at national level, to the growth conditions of Sofia and the establishment of Sofia as a Smart City. ISSS supports the corporate sector by stimulating the creation of better conditions for synergy and partnership in the innovation ecosystem and by the effective use of ICT. ISSS objectives focus on (a) capacity building and market access, including the support for the formation of a centre for excellence in both the ICT and the creative industries; attracting leading investors to invest in R&D; development of ICT scientific and innovation infrastructure; effective implementation of ICT products in all spheres of social and economic life; promotion of international collaboration through attracting doctoral students from outside of EU; organisation of international conferences and forums, and (b) financial capital, establishment of new mechanisms for incubation and financing (particularly in the early stages), and attraction of international funds for risk capital to locate in Sofia.

The creation of local demand for e-services in government, utilities and transport (blue area of the figure) is the core driver for smart growth. Also, ICT companies and startups may profit from externalities for research and innovation, innovation funding, digital skills, and transaction platforms for access to markets.

Figure 2 ICT ecosystem of Sofia: Drivers of digital transformation and growth



Externalities – Public innovation policy

We should read the selection of the Operational Objectives, which is made by stakeholders of Sofia, with respect to strong opinions they share about the digital transformation strategy of Sofia and its sole objective to strengthen the ICT business ecosystem.

- First, they consider the ICT ecosystem of Sofia as an advanced business ecosystem composed of companies having high level of technological competence and expertise to offer any product that is demanded. This explains the selection of one Operational Objective in the ambition statement 1 about the offer conditions. The development of research and innovation capacity is the only objective that focuses on incumbent ICT companies.
- Second, they consider the ICT ecosystem as strongly export-oriented that has not contributed much to the modernisation of the local economy and city life. Moreover, the further growth of the ICT ecosystem itself depends on the creation of local markets for ICT services, enabling the ICT companies to develop a local base for product experimentation and development. The opening of local markets, in government, utilities and transport, is expected to address the dependence of ICT companies from outsourcing, and "moving up the value chain" by business processes to produce highly profitable products and higher-margin products. This explains the focus of 12 out of 16 Operational Objectives in the ambition statement 2 about the local demand conditions.

- Third, some Operational Objectives focus on externalities for ICT companies and start-ups, providing support for funding, technology skills, and market access. Public policy in this field is expected to improve the external conditions for innovation, which are crucial for the ICT start-up ecosystem.

The following figure provides an overview of the full digital transformation strategy for the city of Sofia. The individual components are described in further detail in the following sections and sub-sections.

Figure 3 Overview of the Digital Transformation Strategy for the City of Sofia

4.2. Operational objectives

Operational objectives reflect the means through which the city of Sofia will achieve its ambition statements. They represent the 'how' behind the high-level strategic vision which has been developed by the local working group. As demonstrated in the following table, operational objectives are linked to ambition statements. The city of Sofia has identified 18 operational objectives for its digital transformation strategy.

The following table provides a more detailed presentation of each operational objective.

Table 1 Presentation of the operational objectives of the Digital Transformation Strategy for the city of Sofia

Operational objectives and description	**Link to ambition statements and key city challenges and opportunities**	**Key Success Factors**
OO1.1. To develop the research and innovation capacity of ICT companies to design and develop new applications and smart solutions for the digital transformation of the local economy	Linked to ambition statement 1: To enable most companies in the ICT business ecosystem of Sofia to engage in the digital transformation of the economy	-The creation of externalities in business R&D and collaboration research networks among companies -The provision of innovation funding for small companies -The opening of university infrastructure and research labs to companies
OO2.1. E government market: To develop e-services in the areas of current services provision by the municipality (in order of hierarchy): (1) administration services, (2) primary education, (3) culture and tourism, (4) city planning and construction control, social care, green systems and forestry, local taxes and payments	Linked to ambition statement 2: To open markets or create new markets for e-services at local and national levels, by supporting and facilitating the provision of e-services access provided by ICT companies to other industries, the public administration, and utility organisations.	-The political engagement at various administration tiers to provide administration and government services online -The Internal capacity of the public administration to design e-services and support the daily administration of these services. -The training of public administration personnel for managing the back-end of e-services software applications -The definition of the overall architecture of e-services -The parallel digitisation of public administration archives
OO2.2. E government market: To improve e-skills (1) internal in the public administration to use and manage platforms for e-services, (2) external in the city population to use e-services and online forms		
OO2.3. E government market: To transform internal processes and break-down silos in the public administration related to the provision of e-services		

Operational objectives and description	Link to ambition statements and key city challenges and opportunities	Key Success Factors
OO2.4. E government market: To offer open datasets of the public administration and create datasets in collaboration with city stakeholders		-The creation of the above capabilities within a short time frame of 1-3 years
OO2.5. Utilities market: To develop e-services in areas such as: (1) energy and water saving, (2) optimisation of public lighting, (3) smart metering, (4) environmental monitoring, (5) demand prediction, (6) identification of water leakage and energy loss incidents	Linked to ambition statement 2: To open markets or create new markets for e-services at local and national levels, by supporting and facilitating the provision of e-services access provided by ICT companies to other industries, the public administration, and utility organisations.	-The adaptation of regulations and institutional framework enabling the provision of e-services in the domain of utilities -The experimentation with pilot projects for e-services for energy and water supply -The adaptation of investment plans of utility service providers for the interconnection of physical infrastructure to smart grids -The creation of an efficient security network against cybercrime in energy and water provision
OO2.6. Utilities market: To change the mindset of (1) the public administration, (2) customers and users, in adopting smart meters and sensor-based solutions for optimisation and (3) adopt behaviour for energy / water saving		
OO2.7. Utilities market: Develop the interconnection of physical and digital infrastructures		
OO2.8. Utilities market: To develop flexible and adapted business models for e-utilities		
OO2.9. Transportation market: To develop e-services for transport / green mobility in areas such as: (1) traffic flow monitoring in real time, (2) traffic emissions monitoring, (3) parking in the city, (4) usage of vehicles, (5) mobility as a service, (6) ticketing, (7) micro-logistics in the city, (8) user satisfaction from public transport	Linked to ambition statement 2: To open markets or create new markets for e-services at local and national levels, by supporting and facilitating the provision of e-services access provided by ICT companies to other industries,	-The mapping of mobility demand and supply in the metropolitan area of Sofia and the suburbs -The institutional coordination of transportation service providers for the development of interoperable systems

Operational objectives and description	Link to ambition statements and key city challenges and opportunities	Key Success Factors
OO2.10. Transportation market: To create a platform enabling the integration of all software solutions, data, service providers, and communities active in the sector of urban transportation (public operators, taxis, sharing and pooling of any transportation means, and other	the public administration, and utility organisations.	-The development of an efficient security framework for car sharing solutions
OO2.11. Transportation market: To develop platforms for car-pooling and car-sharing that reduce car ownership and individual use of vehicles that have a public and non-profit character		
OO2.12. Transportation market: To apply flexible pricing models, based on data to encourage the use of public transport		
OO3.1. To establish new mechanisms for incubation and financing (particularly early stage)	Linked to ambition 3: To enhance the local innovation ecosystem by funding mechanisms and skills supporting the start-up ecosystem	-The strengthening of the international profile of Sofia as location for start-up incubation and funding -The support of international cooperation and networking in the Balkans and south Europe in start-up incubation and funding -Provide inspiration, support and stimulation for disruptive start-ups
OO3.2. To develop e-platforms that connect start-ups to markets and governments		
OO3.3. To change the mentality of young people about start-ups creation and scale-up		
OO3.4: To encourage international funds for risk capital to locate in Sofia (RIS3 Sofia)		

Operational objectives and description	Link to ambition statements and key city challenges and opportunities	Key Success Factors
OO3.5: To offer university education in entrepreneurship, STEM, and interdisciplinary engineering and informatics		

In summary, there are 18 operational objectives, each of them linked to one of the strategy ambition statements. Linked to the first ambition statement there is one operational objective which is a broad one and is going to be achieved through the activities targeting the other operational objectives. Twelve of the operational objectives deal with ambition statement 2 – To open markets or create new markets for e-services at local and national levels. Those objectives focus in three key areas – e-government, utilities and transportation. The final 5 objectives aim to achieve ambition 3 by further developing the local ICT start-up and innovation ecosystem and thus, increase the capability of Sofia-based businesses to create digital solutions.

5. Digital strategy roadmap and planned activities

The roadmap is the component of the digital transformation strategy that describes the practical implementation of the strategy, including priority activities and governance. Priority activities refer to the specific actions through which the strategy will be implemented. An activity can be described as a tangible and concrete action, which has a beginning and an end, accompanied by a specific objective and resources for its implementation. The results of activities **(i.e. outputs)** are meant to contribute to reaching the operational objectives identified in the previous section, which in turn will contribute to the city's ambition and mission.

5.1. Overview of proposed activities

The digital transformation strategy for the city of Sofia will be implemented through a group of activities, identified with the contribution of local stakeholders. During the meetings of the working groups activities were identified towards achieving all 18 operational objectives. The Digital City leadership team and the experts decided the Strategy should focus on activities that involve digital solutions. Thus, for now, the city has decided to implement 14 activities, as described in the following table. The list of activities may be modified with time and is expected to be continually updated and expanded after the end of the DCC.

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
2.1.1: Online platform for services in schools	OO2.1. E government market: To develop e-services in the areas of current services provision by the municipality (in order of hierarchy): (1) administration services, (2) primary education, (3) culture and tourism, (4) city planning and construction control, social care, green systems and forestry, local taxes and payments	Sofia Municipality, Regional Education Inspectorates	For a few years now there has been an operating system for acceptance and attendance in kindergartens. Expand it to the public schools and build new functionalities that allow new e-services. General goal – improve the communication between student parents and schools
2.2.1: Improvement of Sofia Municipality digital presence	OO2.2. E government market: To improve e-skills (1) internal in the public administration to use and manage platforms for e-services, (2) external in the city population to use e-services and online forms	Sofia Municipality	Analyse and redesign the website of Sofia Municipality so it is more user-friendly with easy to find instructions and links to e-services that are already available. General goal – increase the use of existing e-services by the general public
2.3.1: Online contract and public tender platform	OO2.3. E government market: To transform internal processes and break-down silos in the public administration related to the provision of e-services	Sofia Municipality	Create an internal system for control over contracts and public tenders. General goal – make the control over contract terms and execution more efficient
2.4.1: Distributed platform of urban data	OO2.4. E government market: To offer open datasets of the public administration and create datasets in collaboration with city stakeholders	Sofia Municipality	Creating a Data Lake – a storage repository that holds a vast amount of raw data in its native format, including structured, semi-structured and unstructured data. The data lake will not only be used to store data from and for the municipality but also business, citizens, academia. After creating the data lake, we would expand with different modules used for

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
			analytics, visualisation, and modelling, thus creating a data hub. General goal – help stakeholders be more informed and facilitate evidence based policy making
2.4.2: Sofia's Digital twin (cyber-physical platform for decision-making optimisation)	OO2.4. E government market: To offer open datasets of the public administration and create datasets in collaboration with city stakeholders	Sofia Municipality	Digital twin – a digital profile of the physical city that helps to optimise its performance and can be used as a platform for planning and decision- making but also experimentation, and research and development. General goal – Help decision makers and experts to better plan and make decisions about development of the city
2.5.1: Dashboard for real-time utilities consumption	OO2.5. Utilities market: To develop e-services in areas such as: (1) energy and water saving, (2) optimisation of public lighting, (3) smart metering, (4) environmental monitoring, (5) demand prediction, (6) identification of water leakage and energy loss incidents	Sofia Municipality	Pilot project for creation of e-utility services in help for building owners to save energy, gas and water. Use smart sensors. Create a mobile app/website for following utility consumption in real time. Testing in 3-5 properties (manufacturing, administrative, residential, retail). General goal – optimisation of utility costs
2.8.1: Development of utilities efficiency model	OO2.8. Utilities market: To develop flexible and adapted business models for e-utilities	Sofia Municipality (new team responsible for the project), business	Development of a single model for efficiency based on meteorological conditions – create an online platform for data collection and analysis that helps utility companies to increase the efficiency of resource utilisation. General goal: increased efficiency and service quality

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
2.9.1: Transport modelling	OO2.9. Transportation market: To develop e-services for transport / green mobility in areas such as: (1) traffic flow monitoring in real time, (2) traffic emissions monitoring, (3) parking in the city, (4) usage of vehicles, (5) mobility as a service, (6) ticketing, (7) micro-logistics in the city, (8) user satisfaction from public transport.	OP Sofproect, Sofia Municipality	Creation of a dynamic transport model of the city. To be used to test scenarios. General goals: better planning and mobility management in the city
2.10.1: Integrated Mobility Platform	OO2.10. Transportation market: To create a platform enabling the integration of all software solutions, data, service providers, and communities active in the sector of urban transportation (public operators, taxis, sharing and pooling of any transportation means, and others)	Sofia Municipality, Sofia Urban Mobility Centre	Create an integrated mobility platform that provides real time information about all types of transport and routes in the city. General goal: optimise mobility as a service
2.11.1: Neighbourhood car sharing	OO2.11. Transportation market: To develop platforms for car-pooling and car-sharing that reduce car ownership and individual use of vehicles that have a public and non-profit character	Sofia Municipality, buildings residents, the business	Pilot project to build a platform for shared electric cars for a certain number of neighbouring residential buildings. General goals: improve the urban environment
2.12.1: Integrated tariffs and common charging model across mobile services	OO2.12. Transportation market: To apply flexible pricing models, based on data to encourage the use of public transport	Sofia Municipality Council, Sofia Municipality, Sofia Urban Mobility Centre, car/bicycle sharing businesses	Create a common charging model (integrated tariffs) for all types of mobile services. General goals: promote the use of public transport
3.1.1: Digital and physical space for start-ups located in Sofia	OO 3.1: To establish new mechanisms for incubation and financing (particularly in the early stages) (RIS3 Sofia)	Sofia Municipality, Sofia Investment Agency, The Municipal	Development of new or customisation of an existing e-platform for start-ups and scale-ups.

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
	OO 3.2: To develop an e-platform that connects start-ups to investors OO 3.3: To change the mentality of young people about start-ups creation and scale-up	Guarantee Fund for SMEs	Creation of an office for consultations for founders. The team there would also be responsible for synchronising, supporting and developing existing initiatives engaged with inspiring entrepreneurial qualities and innovative thinking. General goals: promote entrepreneurial qualities and innovative thinking among young people, improve founders' entrepreneurial skills, make it easier for start-ups and investors to connect
3.4.1: Promotion of Sofia as a risk investment destination	OO 3.4: To encourage international funds for risk capital to locate in Sofia (RIS3 Sofia)	Sofia Investment Agency	Implement an analysis to identify sectors in Sofia with high potential for risk investment General goals: attract more funding opportunities for local start-ups
3.5.1: International university for advanced digital skills and entrepreneurship	OO 3.5: To offer university education in entrepreneurship, STEM, and interdisciplinary engineering and informatics	Sofia Municipality	Developing a concept for attracting an international university and students and identifying potential locations General goals: attracting an international university or introducing an international program in a local university in the field of entrepreneurship and interdisciplinary engineering

A detailed presentation of each activity is presented in the Appendix I.

5.2. The pilot activities: Digital and physical space for start-ups located in Sofia, Promotion of Sofia as a risk investment destination, Online platform for services in schools

In order to begin the implementation of the strategy, the city of Sofia has decided to carry out three pilot activities: Digital and physical space for start-ups located in Sofia, Promotion of Sofia as a risk investment destination, Online platform for services in schools.

Digital and physical space for start-ups located in Sofia

This activity was chosen as a pilot as it is expected to have a high impact in developing the start-up ecosystem in Sofia. Also, there are already undergoing actions related to this activity. The expected results include better entrepreneurial skills among young people, increased number of new businesses and more sustainable start-ups, more funded start-ups, better reputation of Sofia as a start-up location. The responsible organisations for implementing that activity are Sofia Municipality, Sofia Investment Agency, The Municipal Guarantee Fund for SMEs. The period necessary to implement the activity is 18 months. Potential sources of funding are EU funds, Fund of Funds, Sofia Municipality, Ministry of education and science, America for Bulgaria, Sofia Tech Park and local business.

Promotion of Sofia as a risk investment destination

This activity was chosen as a pilot as it is expected to have a high impact in promoting Sofia internationally as an entrepreneurship and innovation hub. The expected results include increased number of funded start-ups, improved potential for internationalisation of the funded start-ups, positive affect on the local investor environment. The responsible organisation for implementing that activity is Sofia Investment Agency. The period necessary to implement the activity is 24 months. Potential sources of funding are EU funding, Sofia Municipality, Fund of Funds and grant schemes.

Online platform for services in schools

This activity was chosen as a pilot as this is an important social issue in the city of Sofia. Also, there is already an existent similar service for kindergartens so this one will be easier to implement. The expected results include better communication between parents and schools and higher student attendance. The responsible organisations for implementing that activity are Sofia Municipality and Regional Education Inspectorate. The period necessary to

implement the activity is 12 months. Potential sources of funding are EU funding, Sofia Municipality.

5.3. Timetable for implementation

It is foreseen the strategy will be implemented for the next 3.5 years. Activities will be gradually implemented, on the basis of the following indicative timetable.

Table 2 Timetable for the implementation of the digital transformation strategy for the city of Sofia

Activity	Jan-Jun 2019	Jul-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022
2.1.1: Online platform for services in schools (pilot)							
2.2.1: Improvement of Sofia Municipality digital presence							
2.3.1: Online contract and public tender platform							
2.4.1: Distributed platform of urban data							
2.4.2: Sofia's Digital twin (cyber-physical platform for decision-making optimisation)							
2.5.1: Dashboard for real-time utilities consumption							
2.8.1: Development of utilities efficiency model							
2.9.1: Transport modelling							
2.10.1: Integrated Mobility Platform							
2.11.1: Neighbourhood car sharing							
2.12.1: Integrated tariffs and common charging model across mobile services							
3.1.1: Digital and physical space for start-ups located in Sofia (pilot)							
3.4.1: Promotion of Sofia as a risk investment destination (pilot)							
3.5.1: International university for advanced digital skills and entrepreneurship							

6. Strategy governance

Governance is the implementation framework of the strategy for digital transformation. It consists of a set of rules, procedures and processes through which the implementation of the strategy will be overseen, managed and updated. Each governance setting is unique and therefore, there is no single solution that can be universally applied to every regional context. The **institutional framework** is the most important contextual factor that influences governance through legislation and the autonomy of the governance processes. In Sofia, the Smart Specialisation Strategy (S3), which is national, partly defines the legal and administrative framework for the DTSS. On the other hand, there is limited autonomy of the municipal government in managing the wider process of innovation- and digital agenda-based transformation, which are frameworks for the DTSS. Both, S3 and limited municipal autonomy drive toward a **participatory governance model**, based on the alliance of many stakeholders. Since the Sofia S3 is grounded on the Quintuple Helix model, it is important to have all 5 stakeholder groups represented in the DTSS governance: industry, academia, administration, users (groups and organisations, representing the citizens), experts in sustainable development of environment and use of natural resources.

The governing bodies will be responsible for creating the necessary procedures to insure a suitable implementation of the **digital technologies and applications.** The priorities will be open source software and modularity. Software development can choose between different solutions of control and collaboration. Control options range from using proprietary software, through a usage permission granted according to a license which describes the usage conditions in detail, to Free Open Source Software (FOSS), which offers full control over the software through an ex-ante agreement about the rights to use, modify and distribute software. Collaboration options range from full in-house development to external collaboration with local or global developers. The collaboration or development model is independent from the software control model, as collaboration can take place both in proprietary software and FOSS. A public repository of solutions, a government cloud (G-cloud) may enable a modular development of solutions and applications and re-combination of developed modules into new solutions. When employing the cloud related technologies, government departments can usefully deploy SOA (service-oriented-architecture) for the construction of software for distributed computing, e-services and integration of software applications.

Datasets and data will be organised into a Distributed Open Data Repository (DODR – a storage repository holding various types of data for Sofia which is open to the public. The journey to implement open data and create a dashboard will require a detailed and well-executed set of activities, from organisational development and executive orders to data organisation and technology modernisation. At the outset, the Mayor/Sofia Municipal Council should consider establishing an **Office of the Chief Digital Officer (OCDO)** to be led by a newly appointed Chief Digital Officer, a director-level position that will have the executive authority to mobilise the open data initiative across the Municipality's varied departments. The primary responsibility of the OCDO is to establish a system for data management and the policies and practices that ensure that data is collected, stored, analysed and shared consistently across the municipality and the organisations collaborating in the DORD. A CDO is also an important function in the establishment of the city data platform – one of the 14 identified activities. The CDO should work to enable the curation of adequate data and enable adoption of data-driven decision-making across the organisation.

The organisation responsible for overseeing the implementation of the DTSS is going to be Sofia Investment Agency. The Mayor/Sofia Municipal Council should also consider establishing **Sofia Digital Agency (SDA)**. SDA can take over the functions related to the DTSS implementation monitoring from Sofia Investment Agency. Another responsibility of the SDA will be to facilitate the long-term digital transformation of Sofia through identifying new opportunities for digital/smart city projects and working towards their implementation. This team can be either a newly formed municipal organisation or part of an already existing one.

Stakeholder and user engagement is a critical part of DTSS implementation and includes information exchange and communication; engagement / participation / collaboration / (co)-production; participatory decision-making; and open governance. Altogether, user engagement, implementation of participatory models of governance, creation of collaborative ecosystems, and optimisation of user behaviour are the real objectives of technologies and data implemented. Stakeholder engagement has already started through the work done on developing the DTSS. The engagement is going to continue by the selection of key stakeholders relevant to the domains of the DTSS, namely, start-up ecosystem, government, utilities and transport. The selection may include individuals, groups, agencies or organisations that are involved in DTSS in any way. Four-five key stakeholders will be chosen to take part in **four Advisory boards** – one for each domain (start-up ecosystem, transport, utilities, government). Each Advisory board is going to consist of representatives of the respective areas and will be coordinated by Sofia Investment Agency or the SDA. The Chief Digital Officer is going to be part of the government advisory board. Advisory boards are going to meet once

a month with the businesses/organisations implementing each digital activity from the DTSS to monitor the implementation progress. Those businesses/organisations will have the responsibility of conducting the necessary day-to-day management of each activity including measurement and impact analysis and reporting to advisory boards. The composition of the advisory boards and the decision-making process are the starting point of the DTSS implementation.

Figure 4 Governance structure for the DTSS implementation

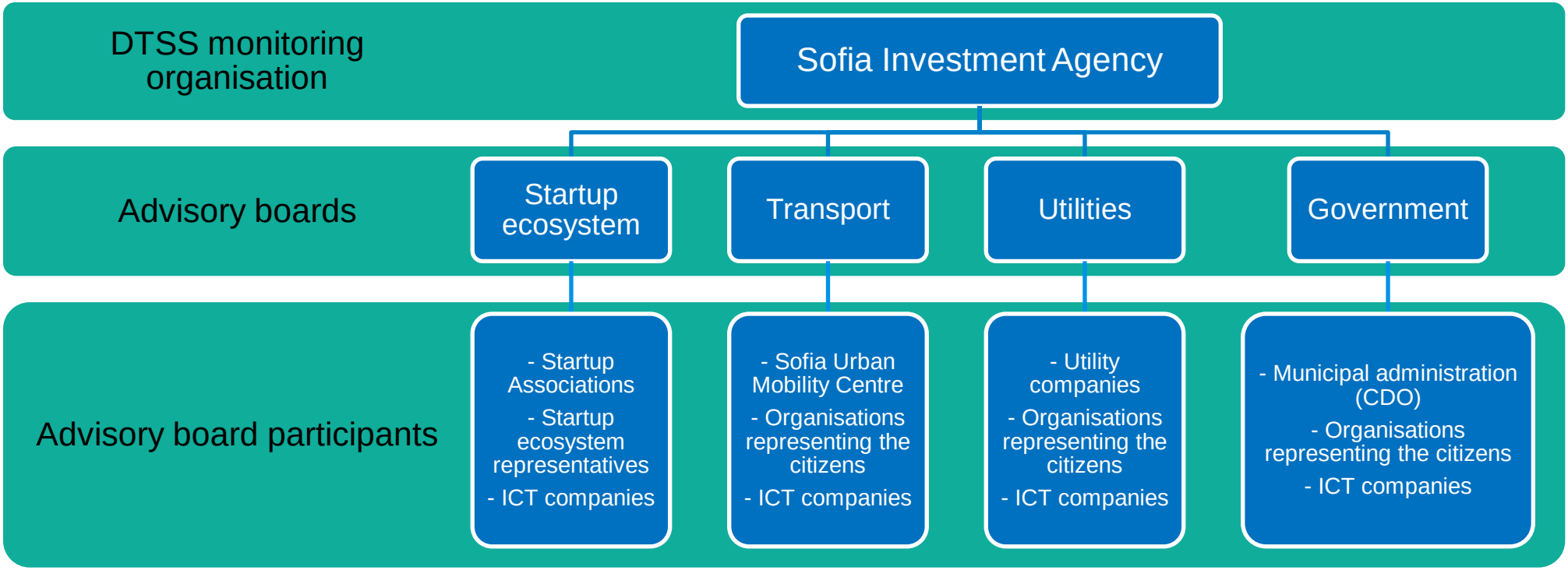
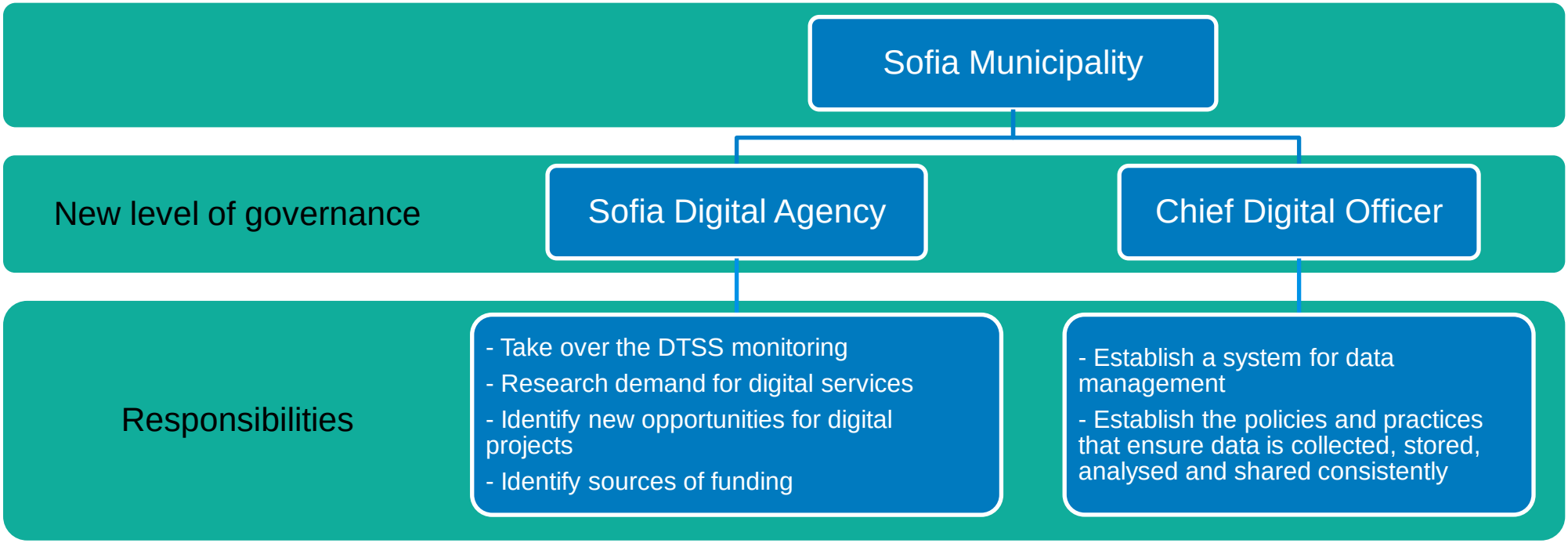


Figure 5 Suggested new level of governance



Measurement and impact analysis will monitor and assess the DTSS implementation and its short- and long-term results. Many monitoring systems are available, which focus on urban characteristics, policy and planning efforts, and digital infrastructure operation. A good methodology of measurement and assessment should include a clear statement about the measurable objectives, outcome and result indicators defined with respect to actions to be implemented, regular measurement of efforts, use of dashboards, and user satisfaction that capture and reveal the impact of DTSS. This model combines policy-focused and city-focused methodologies. Online tools and applications, which are available and open source will be used to create robust real-time monitoring and assessment systems. Substantive outputs, which are direct consequence of the implementation of the DTSS, will be assessed against changes in the real economy, governance, infrastructure and behavioural or procedural changes in the city.

Challenges for the DTSS

- More details and feasibility studies of each activity are needed before continuing with the implementation. This will require funds.
- Lack of engagement of some utility companies.
- Lengthy approval procedures in the Municipality and other stakeholders.

7. Monitoring and evaluation of the Digital Transformation Strategy

In order to monitor and assess progress achieved as part of the digital transformation strategy, a performance assessment framework has been developed by the city team. In addition, the team has outlined preliminary evaluation plans and resources as part of an early evaluation plan.

7.1. Performance assessment framework

Strategy implementation and results monitoring will be conducted with the leading role of Sofia Investment Agency on the basis of the performance assessment framework presented in Appendix II. Three levels of monitoring indicators and targets have been defined:

- **Outcome indicators** have been established at the level of the Ambition Statements.
- **Intermediate outcome** indicators have been established at the level of operational objectives.
- **Output indicators** have been established at the level of activities.

Sofia Investment Agency will be in charge of collecting data on all strategy monitoring indicators. However, it is expected that activity implementing partners will also play a key role in generating, collecting and sharing performance data. This information will be used for internal monitoring and reporting purposes. As such it will be communicated to Advisory boards on a regular basis.

The performance assessment framework will surely evolve as the city enters the full strategy implementation phase. The regularity and depth of monitoring will also be further specified by the steering bodies.

7.2. Strategy evaluation plan

In addition to monitoring the progress of strategy implementation, the Digital Transformation Strategy for Sofia will undergo an internal and external evaluation within the next 3 years. The objective of the evaluation mainly be to verify the extent to which expected strategy results have been achieved, review the relevance of selected strategy priorities and objectives, and review the efficiency of strategy implementation and governance schemes. The evaluation

questions guiding the evaluation will be defined by Sofia Investment Agency with the support of the Advisory boards.

An additional impact evaluation may be conducted after 7 years of strategy implementation. The impact evaluation will be mainly focused on assessing strategy outcomes and likelihood of impact.

When relevant, individual activity managers will be encouraged to conduct activity-specific evaluations and assessments. The information drawn from activity evaluations and assessment will feed into the general strategy evaluations.

8. Results achieved and next steps

The participation of Sofia in the Digital Cities Challenge initiative has led to the achievement of a number of results. The assessment of the digital maturity of Sofia contributed for raising the awareness both internally in the Municipality and externally among local stakeholders for the need of digitalisation. The work Sofia Investment Agency did on the project created a community with over 100 people engaged in workshops and online assessments. There was a very high level of engagement from IT companies, the water utility operator Sofiyska voda, the Urban Mobility Centre and financing institutions among others. During the process Sofia Investment Agency established itself locally and internationally as a point of contact for digital projects in the city. Due to a targeted marketing effort of Sofia Investment Agency there is an increased overall awareness about the DCC project throughout the city.

The Digital Cities Challenge initiative is the foundation for further work on Sofia's digitalisation. Sofia Investment Agency is already working on submitting the Digital Transformation Strategy for review and vote by the Sofia Municipal Council. The team is also discussing the city's digital governing structure with high-level officials from other European cities such as Vienna in order to learn about their good practices. Some future steps related to the project include establishing Advisory Boards and organising their first meetings as well as conducting feasibility studies on identified activities.

As a result of the work on Digital Cities Challenge Sofia Investment Agency was invited to represent Sofia in three other projects. The team was invited to partner in a project under Horizon 2020 with fellow DCC cities Heidelberg and Antwerp. The aim of the project is to replicate successful smart city initiatives between the participating partners. The application for that project was submitted in March 2019. Another invitation was received to partner with fellow DCC cities (Kavala and Algeciras) under URBACT, but due to other proposals submitted by the city the team was not eligible. As a result of contacts made during DCC city workshops, we were contacted by a local financing institution and are now in the process of applying for advisory support from EIB for the creation of a Pipeline for Digitalisation of City Projects. The aim of the project is to develop a mechanism/procedures for identifying and attracting digitalisation projects to Sofia and helping those projects secure funding

Appendix I: Detailed presentation of activities

2.1.1: Online platform for services in schools	
Link to operational objective	OO2.1. To develop e-services in the areas of current services provision by the municipality (in order of hierarchy): (1) administration services, (2) primary education, (3) culture and tourism, (4) city planning and construction control, social care, green systems and forestry, local taxes and payments
Description	For a few years now there has been an operating system for acceptance and attendance in kindergartens. The goal is to expand it to the public schools and build new functionalities that allow new e-services such as attendance monitoring, menu choice, payments and another communication channel between parents and schools / kindergartens. Target population – students, parents, teachers General goal – improve the communication between student parents and schools Specific goals – make it possible for parents to tailor their kids' experience based on individual needs, make the services more cost-efficient, make it easier and less time-consuming for parents to communicate with the school teachers of their children Means of delivery – website Expected outcomes – better communication between parents and schools, higher student attendance Conditions for success – willingness and ability of school staff to employ the new platform, attracting outside vendors (meal providers etc.) into using the platform
Timeframe	• Length: 12 months • Estimated date of implementation: June 2020
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€200 000 Potential sources of funding: EU funding, Municipal funds
Organisation / unit in charge of delivery	Sofia Municipality, Regional Education Inspectorates

2.2.1: Improvement of Sofia Municipality digital presence	
Link to operational objective	OO2.2. E government market: To improve e-skills (1) internal in the public administration to use and manage platforms for e-services, (2) external in the city population to use e-services and online forms
Description	Analyse and redesign the website of Sofia Municipality so it is more user-friendly with easy to find instructions and links to e-services that are already available. Target population – Sofia Municipality, city population General goal – increase the use of existing e-services by the general public Specific goals – analyse and improve the Sofia Municipality website so it is easier for citizens to find the necessary information and e-services and thus, to encourage people to use those services more often Means of delivery – a marketing team to analyse the website, UX designers to redesign it and an IT team to program it Expected outcomes – higher usage of e-services provided by institutions Conditions for success – willingness of Sofia Municipality to edit its website
Timeframe	• Length: 9 months • Estimated date of implementation: March 2020
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€50 000 Potential sources of funding: EU funding, Municipal funds
Organisation / unit in charge of delivery	Sofia Municipality

2.3.1: Online contract and public tender platform	
Link to operational objective	OO2.3. To transform internal processes and break-down silos in the public administration related to the provision of e-services
Description	Create an internal system for control over contracts and public tenders. Target population – municipal employees General goal – make the control over contract terms and execution more efficient Specific goals – provide a tool for different levels within the administration to collaborate and more efficiently control the contract terms and their execution Means of delivery – system Expected outcomes – Internal system for control over contracts and public tenders Conditions for success – willingness of municipal employees to use the system
Timeframe	• Length: 6 months • Estimated date of implementation: January 2020
Indicators to be achieved	Refer to Appendix II.

2.3.1: Online contract and public tender platform	
Estimated cost and source of funding	€50 000 Potential sources of funding: EU funding, Municipal funds
Organisation / unit in charge of delivery	Sofia Municipality

2.4.1: Distributed platform of urban data	
Link to operational objective	OO2.4. To offer open datasets of the public administration and create datasets in collaboration with city stakeholders
Description	Creating a Data Lake – a storage repository that holds a vast amount of raw data in its native format, including structured, semi-structured and unstructured data. The data lake will not only be used to store data from and for the municipality but also business, citizens, academia. After creating the data lake, we would expand with different modules used for analytics, visualisation, and modelling, thus creating a data hub - a hub-and-spoke approach to data integration, where data is physically moved and re-indexed into a new system. To be a data hub (vs. a data lake) this system would support discovery, indexing and analytics. Target population – municipality, business, citizens, academia, policy makers, research institutes General goal – help stakeholders be more informed and facilitate evidence based policy making Specific goals – collect data, create a storage place where to keep it, use unified data to optimise the performance of the city, offer data to stakeholders so they can make more informed decisions but also experimentation, and research and development, help businesses create new products/solutions, keep citizens informed Means of delivery – analysis of what data would be useful for stakeholders, information systems, website, partnership with research organisations, promotional events Expected outcomes – having large amounts of data available to the public Conditions for success – availability of data, willingness of data collectors/owners to share it, timely updates to secure data integrity
Timeframe	• Length: 24 months • Estimated date of implementation: June 2021
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€5 M Potential sources of funding: EU funding (already preparing application for Urban innovative actions), Municipal funds
Organisation / unit in charge of delivery	Sofia Municipality
2.4.2: Sofia's Digital twin (cyber-physical platform for decision-making optimisation)	

2.4.1: Distributed platform of urban data	
Link to operational objective	OO2.4. To offer open datasets of the public administration and create datasets in collaboration with city stakeholders
Description	Digital twin –a digital profile of the physical city that helps to optimise its performance and can be used as a platform for planning and decision-making but also experimentation, and research and development. Target population – municipality, citizens General goal – Help decision makers and experts to better plan and make decisions about development of the city Specific goals – use data to optimise the performance of the city, offer data to stakeholders so they can make more informed decisions, keep citizens informed Means of delivery – information systems, Expected outcomes – Digital twin of the city, combining all existing information about infrastructure, transport etc. Conditions for success – availability of data, willingness of data collectors/owners to share it
Timeframe	• Length: 12 months • Estimated date of implementation: June 2021
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€500 000 Potential sources of funding: EU funding, Municipal funds
Organisation / unit in charge of delivery	Sofia Municipality

2.5.1: Dashboard for real-time utilities consumption	
Link to operational objective	OO2.5. Utilities market: To develop e-services in areas such as: (1) energy and water saving, (2) optimisation of public lighting, (3) smart metering, (4) environmental monitoring, (5) demand prediction, (6) identification of water leakage and energy loss incidents
Description	Pilot project for creation of e-utility services in help for building owners to save energy, gas and water. Use smart sensors. Create a mobile app/website for following utility consumption in real time. Testing in 3-5 properties (manufacturing, administrative, residential, retail). In cooperation with IT companies, Sofiyska voda, CEZ, Overgas and end users Target population – manufacturing, administrative, residential, retail properties General goal – optimisation of utility costs Specific goals – development of an e-service to help property owners follow their consumption in real time, make any changes if necessary or get notified about water leakage and energy loss incidents Means of delivery – smart sensors, information systems, communication environment (connectivity between sensors and information systems),

2.5.1: Dashboard for real-time utilities consumption	
	test infrastructure (buildings and infrastructure of utility companies), experts in the relevant field Expected outcomes – optimised utility consumption and minimisation of losses Conditions for success – attracted partners (properties and utility providers), engagement
Timeframe	• Length: 12 months • Estimated date of implementation: December 2020
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€100 000 (30 sensors for 5 buildings, communication environment, software) Potential sources of funding: EU funding, business, utility companies, property owners
Organisation / unit in charge of delivery	Sofia Municipality

2.8.1: Development of utilities efficiency model	
Link to operational objective	OO2.8. Utilities market: To develop flexible and adapted business models for e-utilities
Description	Development of a single model for efficiency based on meteorological conditions – create an online platform for data collection and analysis that helps utility companies to increase the efficiency of resource utilisation. The platform will need as much data as possible on meteorological conditions (precipitation, temperatures, wind) and consumption of utilities (water, electricity, gas, heating) in Sofia in the last 10 years, as well as continuous collection of that data. Those statistics will be collected from existing meteorological stations. Figures on precipitation in Rila mountain will also be used as Iskar river originating from Rila is the main source of water for Sofia. Based on that information, an analysis of the correlation between the two is going to be done. This will help utility companies forecast the future demand for their services and thus, adapt their business models and become more efficient. Target population – all utility companies and industrial end users General goal – increased efficiency and service quality Specific goals – creation of a database with meteorological conditions accessible by utility companies; modelling of resource usage Means of delivery – technology for collecting, storing and processing data (IT infrastructure); topic-specific knowledge Expected outcomes – developed/adapted business models (solutions) for increasing utility services efficiency Conditions for success – focus groups of utility companies, end users, IT companies, science institutes (providing data) and others
Timeframe	• Length: 24 months • Estimated date of implementation: April 2021

2.8.1: Development of utilities efficiency model	
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€1 M (developing IT infrastructure, buying data, organising events and workshops) Potential sources of funding: EU funding, Municipal funds, VC funds
Organisation / unit in charge of delivery	Sofia Municipality (new team responsible for the project), business (TBC)

2.9.1: Transport modelling	
Link to operational objective	OO2.9. Transportation market: To develop e-services for transport / green mobility in areas such as: (1) traffic flow monitoring in real time, (2) traffic emissions monitoring, (3) parking in the city, (4) usage of vehicles, (5) mobility as a service, (6) ticketing, (7) micro-logistics in the city, (8) user satisfaction from public transport.
Description	Creation of a dynamic transport model of the city. To be used to test scenarios. The data (about traffic, population, public transport, road works) will also be provided to IT companies – potential solution providers General goals: better planning and mobility management in the city Specific goals: making informed decisions about mobility (car parks, traffic lights, public transport, traffic generators, pedestrian crossings) Target group: Sofia Municipality, Sofia Urban Mobility Centre, the business, OP Sofproect Means of delivery: analyse what data is already available and what is missing, collect information/data on origin and destination of travel, software Expected outcomes: better urban planning, cost reduction, higher efficiency, providing an analytical framework for forecasting future demand and areas of high congestion, generating quantitative indicators for assessing business projects and economic initiatives, reducing traffic jams, full understanding of the impact of complex infrastructure decisions Conditions for success: collection of data, coordination between individual information providers, sustainability (updating data continuously – local ICT companies), surveys, sensors
Timeframe	• Length: 24 months (until the release) • Estimated date of implementation: June 2021
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€1 M Potential sources of funding: Sofia Municipality, EU Funds, Sofia Urban Mobility Center
Organisation / unit in charge of delivery	OP Sofproect, Sofia Municipality

2.10.1: Integrated Mobility Platform	
Link to operational objective	OO2.10. Transportation market: To create a platform enabling the integration of all software solutions, data, service providers, and communities active in the sector of urban transportation (public operators, taxis, sharing and pooling of any transportation means, and others)
Description	Create an integrated mobility platform that provides real time information about all types of transport and routes (e.g. for bicycles) in the city - public transport, trains, shared cars and bicycles, parking options for cars and bicycles, hoverboards, electric kick scooters and Vespas. The platform will be with open data so it will create an opportunity for new businesses to be created from it. General goal: optimise mobility as a service Specific goals: reduce travel time, reduce the number of cars, improve transport accessibility, improve resource planning for transport companies Target group: citizens and visitors of Sofia, the business, the Municipal administration Means of delivery: Analysis of the legal framework and its linking with the data for the transport services, an awareness campaign about green mobility and means of mobility in Sofia other than private cars Expected outcomes: reduced number of cars, reduced air pollution, less traffic jams, reduced travel time, increased share of bicycle transport by 5%, increased share of public and bicycle transport at the expense of private cars, better transport accessibility, better resource planning Conditions for success: involvement of Sofia Municipality and stakeholders, sustainability (updating data continuously),
Timeframe	• Length: 36 months • Estimated date of implementation: June 2022
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€500 000 Potential sources of funding: Sofia Municipality, EU Funds, Sofia Urban Mobility Centre, “Fund of Funds”, Public-private partnerships
Organisation / unit in charge of delivery	Sofia Municipality, Sofia Urban Mobility Centre

2.11.1: Neighbourhood car sharing	
Link to operational objective	OO2.11. Transportation market: To develop platforms for car-pooling and car-sharing that reduce car ownership and individual use of vehicles that have a public and non-profit character
Description	Pilot project to build a platform for shared electric cars for a certain number of neighbouring residential buildings (400-500 apartments) General goals: improve the urban environment Specific goals: adopt the project, reduce the number of cars Target population: buildings residents Means of delivery: communication with businesses and buildings residents Expected outcomes: reduced number of cars, less traffic jams, less polluted air Conditions for success: analysis (and change) of legal regulations, engagement of residents, availability of parking spaces, successful business model for attracting potential investors
Timeframe	• Length: 12 months • Estimated date of implementation: June 2020
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€50 000 (online platform) Potential sources of funding: Sofia Municipality, EU funds, Sofia Urban Mobility Centre (for the platform), Public-private partnerships for cars and chargers
Organisation / unit in charge of delivery	Sofia Municipality, buildings residents, the business

2.12.1: Integrated tariffs and common charging model across mobile services	
Link to operational objective	OO2.12. Transportation market: To apply flexible pricing models, based on data to encourage the use of public transport
Description	Create a common charging model (integrated tariffs) for all types of mobile services (including car/bicycle sharing, parking, public transport) General goals: promote the use of public transport Specific goals: reduce the number cars and the amount of emissions, less traffic jams, create flexible tariff plans Target population: citizens and visitors of Sofia, car/bicycle sharing businesses Means of delivery: communication with businesses Expected outcomes: reduced number of cars and amount of emissions, less traffic jams, created flexible tariff plans Conditions for success: integration of individual charging systems
Timeframe	• Length: 12 months • Estimated date of implementation: June 2021

2.12.1: Integrated tariffs and common charging model across mobile services	
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€500 000 Potential sources of funding: EU funding, Municipal funds, Sofia Urban Mobility Centre
Organisation / unit in charge of delivery	Sofia Municipality Council, Sofia Municipality, Sofia Urban Mobility Centre, car/bicycle sharing businesses

3.1.1: Digital and physical space for start-ups located in Sofia	
Link to operational objective	OO3.1: To establish new mechanisms for incubation and financing (particularly in the early stages) (RIS3 Sofia) OO3.2: To develop an e-platform that connects start-ups to investors OO3.3: To change the mentality of young people about start-ups creation and scale-up
Description	Development of a new or customisation of an existing e-platform for start-ups and scale-ups: -Application for onboarding (consulting) -Collaborating module – for pre-screening + feedback for unsuccessful applicants -Training videos -Digital conference/meeting room (video collaboration) for founders and investors -Unified information about start-ups – easy for investors to review -Virtual consulting office -Excellency pool and good practices Creation of an office for consultations for founders (e.g. in Sofia Tech Park). The team there would also be responsible for synchronising, supporting and developing existing initiatives engaged with inspiring entrepreneurial qualities and innovative thinking General goals: promote entrepreneurial qualities and innovative thinking among young people, improve founders' entrepreneurial skills, make it easier for start-ups and investors to connect Specific goals: streamline and facilitate existing dispersed initiatives in the field, provide consulting services to start-ups, attract the necessary critical mass of start-ups and investors Target population: young people and start-up founders in Sofia, investors globally Means of delivery: IT team, good level of website support, (digital) marketing, recommendations by partnering cities (for attracting investors), attraction of key investment funds (VC), unified information about start-ups (easier for investors to review), find at least one partner program/organisation, a team to manage the office, to provide consultation and to sign post founders Expected outcomes: better entrepreneurial skills among young people, raised awareness of young people about career opportunities in entrepreneurship, increased number of new businesses and more sustainable start-ups, more funded start-ups, better reputation of Sofia as a start-up location

3.1.1: Digital and physical space for start-ups located in Sofia	
	Conditions for success: creation of user-friendly website and service, efficient communication campaign, cooperation with other organisations in the start-up ecosystem
Timeframe	• Length: 18 months • Estimated date of implementation: December 2020
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€750 000 Potential sources of funding: EU funds, Fund of funds, Sofia Municipality, Ministry of education and science, America for Bulgaria, Sofia Tech Park, local business
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Sofia Municipality, Sofia Investment Agency, The Municipal Guarantee Fund for SMEs

3.4.1: Promotion of Sofia as a risk investment destination	
Link to operational objective	OO3.4: To encourage international funds for risk capital to locate in Sofia (RIS3 Sofia)
Description	Implement an analysis to identify sectors in Sofia with high potential for risk investment • Promote specific attractive industries in Sofia • Showcase successful examples – evidence-based reports • Develop a recognisable brand of the city as a risk capital destination and promote it (events, networking, relevant initiatives) • Comply a set of information resources necessary for taking risk capital decisions General goals: attract more funding opportunities for local start-ups Specific goals: increase investors' awareness of Sofia, encourage international funds for risk capital to locate in Sofia Target group: international funds, start-up founders Means of delivery: research and analysis, communication campaign Expected outcomes: increased number of funded start-ups, improved potential for internationalisation of the funded start-ups, positive affect on the local investor environment Conditions for success: quality initial research and analysis, successful cooperation between all stakeholders
Timeframe	• Length: 24 months • Estimated date of implementation: June 2021
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€150 000

3.4.1: Promotion of Sofia as a risk investment destination	
	Potential sources of funding: EU funding, Sofia Municipality, Fund of Funds, grant schemes
Organisation / unit in charge of delivery	Sofia Investment Agency

3.5.1: International university for advanced digital skills and entrepreneurship	
Link to operational objective	OO3.5: To offer university education in entrepreneurship, STEM, and interdisciplinary engineering and informatics
Description	Developing a concept for attracting an international university and students and identifying potential locations -Establish relations and cooperation with existing local universities -Support program for local universities to develop international programs/majors -Analysis of present legislation and definition of legislative changes for facilitating and attracting foreign students General goals: attracting an international university or introducing an international program in a local university in the field of entrepreneurship and interdisciplinary engineering Specific goals: develop a feasible concept applicable to the local system Target group: international and local universities, foreign and local students Means of delivery: research best practices in the world, analysis of the existing resources, needs assessment, partnership with academic institutions Expected outcomes: creation of an educational program, better international reputation of Sofia talent Conditions for success: successful cooperation with academic institutions
Timeframe	• Length: 6 months • Estimated date of implementation: December 2019
Indicators to be achieved	Refer to Appendix II.
Estimated cost and source of funding	€100 000 Potential sources of funding: EU funds, Ministry of education and science
Organisation / unit in charge of delivery	Sofia Municipality

Appendix II: Performance assessment framework

1. Strategy outcomes

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Ambition statement 1	To enable most companies in the ICT business ecosystem of Sofia to engage in the digital transformation of the city by developing and offering innovative products and e-services.	Monitoring indicator 1.1: Number of local ICT companies engaged in the digital transformation of the city	Collect information from local ICT companies and from procurement documents	Threefold increase in the number of local ICT companies engaged in the digital transformation of the city	7 years	Collect information from local ICT companies and from procurement documents
Ambition statement 2	To open markets or create new markets for e-services at local and national levels, by supporting and facilitating the provision of e-services to industries, the public administration, and utility organisations.	Monitoring indicator 2.1: Number of launched procurement procedures for e-services on local and national levels	Conduct a research	Target to be set after baseline has been established	10 years	Conduct a research
Ambition statement 3a	To enhance the local innovation ecosystem by funding mechanisms, investor networks and brokerage events, facilitating the digital transformation of the local economy.	Monitoring indicator 3a.1 Number of big events / conferences for enhancing the local innovation ecosystem	Approximately 40 big events and conferences	80	7 years	Online research
Ambition statement 3b	To enhance the skills of the local ICT labour market and the start-up ecosystem for	3b.1: Number of local ICT experts skilful to	Conduct a survey among ICT companies	Increased number local ICT experts skilful to create e-	7 years	Conduct a survey among ICT companies

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
	the creation of e-services and datasets by public and private organisations.	create e-services and datasets		services and datasets by 10%		

2. Strategy intermediate outcomes

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational objective 1.1	To develop the research and innovation capacity of ICT companies to design and develop new applications and smart solutions for the digital transformation of the local economy	This operational objective will does not have a monitoring indicator because there are currently no activities for achieving it.	n/a	n/a	n/a	n/a
Operational objective 2.1	E government market: To develop e-services in the areas of current services provision by the municipality (in order of hierarchy): (1) administration services, (2) primary education, (3) culture and tourism, (4) city planning and construction control, social care, green systems and forestry,	Monitoring indicator 2.1.1: Number of e-services provided by Sofia Municipality	50	200	4 years	Online research and data provided by Sofia Municipality
		Monitoring indicator 2.1.2: Percentage of population using e-services provided by Sofia Municipality	Very low utilisation rate. Data to be provided by Sofia Municipality	At least double utilisation rates compared to the present	4 years	Data to be provided by Sofia Municipality

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
	local taxes and payments					
Operational objective 2.2	E government market: To improve e-skills (1) internal in the public administration to use and manage platforms for e-services, (2) external in the city population to use e-services and online forms	Monitoring indicator 2.2.1: Percentage of people in the public administration who feel comfortable to use and manage platforms for e-services	Conduct a survey	Target to be set after baseline has been established	5 years	Conduct a survey
		Monitoring indicator 2.2.2: Number of people with at least basic digital skills (The Digital Economy and Society Index (DESI)	29% (2018)	45%	5 years	The Digital Economy and Society Index (DESI)
Operational objective 2.3	E government market: To transform internal processes and break-down silos in the public administration related to the provision of e-services	Monitoring indicator 2.3.1: Number of internal processes transferred from physical to digital	Conduct a study. Information to be provided by public institutions	Target to be set after baseline has been established	5 years	Conduct a study. Information to be provided by public institutions
Operational objective 2.4	E government market: To offer open datasets of the public administration and create datasets in collaboration with city stakeholders	Monitoring indicator 2.4.1: Number of open datasets of the public administration	Very limited implementation of open datasets	Procedure for opening datasets completed or started within at least 10 categories of datasets	5 years	Conduct a study

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational objective 2.5	Utilities market: To develop e-services in areas such as: (1) energy and water saving, (2) optimisation of public lighting, (3) smart metering, (4) environmental monitoring, (5) demand prediction, (6) identification of water leakage and energy loss incidents	Monitoring indicator 2.5.1: Number of e-services created in areas such as: (1) energy and water saving, (2) optimisation of public lighting, (3) smart metering, (4) environmental monitoring, (5) demand prediction, (6) identification of water leakage and energy loss incidents	Less than 10 e-services in the utilities area	Procedure for implementation of e-services in the utilities area completed or initiated for at least 20 projects	5 years	Collect information from utility companies and conduct an online research
		Monitoring indicator 2.5.2: Number of active users of those e-services	Data to be provided by website administrators	Target to be set after baseline has been established	5 years	Data to be provided by website administrators
Operational objective 2.6	Utilities market: To change the mindset of (1) the public administration, (2) customers and users, in adopting smart meters and sensor-based solutions for optimisation and adopt behaviour for energy / water saving	This operational objective will does not have a monitoring indicator because there are currently no activities for achieving it.	n/a	n/a	n/a	n/a

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational objective 2.7	Utilities market: Develop the interconnection of physical and digital infrastructures	This operational objective will does not have a monitoring indicator because there are currently no activities for achieving it.	n/a	n/a	n/a	n/a
Operational objective 2.8	Utilities market: To develop flexible and adapted business models for e-utilities	Monitoring indicator 2.8.1: Costs saved by utility companies as a result of using the new platforms	0	5% of annual costs	5 years	Collect information from utility companies
Operational objective 2.9	Transportation market: To develop e-services for transport / green mobility in areas such as: (1) traffic flow monitoring in real time, (2) traffic emissions monitoring, (3) parking in the city, (4) usage of vehicles, (5) mobility as a service, (6) ticketing, (7) micro-logistics in the city, (8) user satisfaction from public transport	Monitoring indicator 2.9.1: Number of e-services for transport / green mobility	Collect information from Sofia Urban Mobility Centre and conduct an online research	Target to be set after baseline has been established	5 years	Collect information from Sofia Urban Mobility Centre and conduct an online research
		Monitoring indicator 2.9.2: Number of organisations using those services on a regular basis	Data provided by website administrators	Target to be set after baseline has been established	5 years	Data provided by website administrators
Operational objective 2.10	Transportation market: To create a platform enabling the integration of all	Monitoring indicator 2.10.1: Number of transport types supported	0	At least 5	5 years	Results visible from the platform

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
	software solutions, data, service providers, and communities active in the sector of urban transportation (public operators, taxis, sharing and pooling of any transportation means, and other					
Operational objective 2.11	Transportation market: To develop platforms for car-pooling and car-sharing that reduce car ownership and individual use of vehicles that have a public and non-profit character	Monitoring indicator 2.11.1: Regular users of such platforms	0	20 000 weekly users	5 years	Data provided by platform administrators
		Monitoring indicator 2.11.2: Share of the population that that uses their own cars individually on a regular basis (%)	38%	30%	5 years	Sofia Municipality data
Operational objective 2.12	Transportation market: To apply flexible pricing models, based on data to encourage the use of public transport	Monitoring indicator 2.12.1: Share of the population that that uses their own cars individually on a regular basis (%)	38%	30%	5 years	Sofia Municipality data
		Monitoring indicator 2.12.2: Number of people taking advantage of flexible pricing models	0	50 000 daily users	5 years	Sofia Urban Mobility Centre

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational objective 3.1	To establish new mechanisms for incubation and financing (particularly early stage)	Monitoring indicator 3.1.1: Number of start-ups benefiting from incubation and financing programmes	Conduct a study	Target to be set after baseline has been established	5 years	Conduct a study
Operational objective 3.2	To develop e-platforms that connect start-ups to markets and governments	Monitoring indicator 3.2.1: Number of users on the e-platform(s)	Non-existent	At least one active platform with at least 500 registered stakeholders (start-ups, financing, public, academic institutions etc.)	5 years	Data will be provided by the website administrators
Operational objective 3.3	To change the mentality of young people about start-ups creation and scale-up	Monitoring indicator 3.3.1: Share of young people involved in entrepreneurial activity	Current early stage entrepreneurial activity in 18 – 24 age group is 3.8% and in 25 - 34 age group is 8%	Improvement in entrepreneurial activity among young people (age group – 18 to 34) by 20%	5 years	Global Entrepreneurship Monitoring Global Report
		Monitoring indicator 3.3.2: Share of the population with perception of entrepreneurship as a good career choice	54.3% (2017)	60%	5 years	Global Entrepreneurship Monitoring Global Report

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational objective 3.4	To encourage international funds for risk capital to locate in Sofia (RIS3 Sofia)	Monitoring indicator 3.4.1: Number of international funds for risk capital located in Sofia (RIS3 Sofia)	Collect information from Bulgarian Venture Capital Association and the Fund of Funds	At least two additional international funds	5 years	Collect information from Bulgarian Venture Capital Association and the Fund of Funds
Operational objective 3.5	To offer university education in entrepreneurship, STEM, and interdisciplinary engineering and informatics	Monitoring indicator 3.5.1: Capacity (number of students) that universities in Sofia have in entrepreneurship, STEM, and interdisciplinary engineering and informatics courses	Collect information from universities	Increase of 10%	5 years	Collect information from universities

3. Strategy outputs

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
Activity 2.1.1: Online platform for services in schools	Expanded online platform	Monitoring indicator 2.1.1.1: Number of e-services on the platform	5	At the platform release	Visible from the platform
		Monitoring indicator 2.1.1.2: Number of parents using the platform	20 000 monthly users	1 year after the release of the platform	Data will be provided by the website administrators
Activity 2.2.1: Improvement of Sofia Municipality digital presence	Updated website of Sofia Municipality	Monitoring indicator 2.2.1.1: Number of e-services on the city's website	Collect information from Sofia Municipality	1 year after the update	Collect information from Sofia Municipality
		2.2.1.2: Sofia's score in Digital Governance Performance Index by Economy Policy Institute	65 points	2 years after the release of the platform	Economy Policy Institute's report
Activity 2.3.1: Online contract and public tender platform	Online contract and public tender platform	Monitoring indicator 2.3.1.1: Share of contracts and public tenders done through the platform	100%	2 years after the release of the platform	Collect information from Sofia Municipality
Activity 2.4.1: Distributed platform of urban data	Online platform for urban data	Monitoring indicator 2.4.1.1: Number of categories of open	At least 5 different categories of datasets	2 year after the release of the platform	Visible from the platform

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
		dataset on the platform			
		Monitoring indicator 2.4.1.2: Number of monthly visitors of the platform	100	1 year after the release of the platform	Data will be provided by the website administrators
Activity 2.4.2: Sofia's Digital twin (cyber-physical platform for decision-making optimisation)	Online cyber-physical platform	Monitoring indicator 2.4.2.1: Number of categories of open dataset on the platform	At least 5 different categories of datasets	2 year after the release of the platform	Visible from the platform
		Monitoring indicator 2.4.2.2: Number of monthly visitors of the platform	500	1 year after the release of the platform	Data will be provided by the website administrators
Activity 2.5.1: Dashboard for real-time utilities consumption	New web/app platform for following utility consumption in real time	Monitoring indicator 2.5.1.1: Number of datasets on the dashboard	3	At the time of release	Visible from the platform
		Monitoring indicator 2.5.1.2: Share of active users	80%	6 months after the platform release	Information provided by test users and website administrators
Activity 2.8.1: Development of utilities efficiency model	New online platform for data on meteorological conditions and their	Monitoring indicator 2.8.1.1: Number of datasets on the platform	5	6 months after the platform release	Visible from the platform

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
	effect on utilities demand	Monitoring indicator 2.8.1.2: Number of utility providers using the platform	5	1 year	Data will be provided by the website administrators
Activity 2.9.1: Transport modelling	New dynamic transport model of the city	Monitoring indicator 2.9.1.1: Number of tests that can be supported	5	2 years after the platform release	Visible from the platform
		Monitoring indicator 2.9.1.2: Number of organisations using the model	5	1 year after the platform release	Data will be provided by the website administrators
Activity 2.10.1: Integrated Mobility Platform	New online platform that provides real time information about all types of transport and routes in the city	Monitoring indicator 2.10.1.1: Number of transport types supported	5	At the time of release	Visible from the platform
		Monitoring indicator 2.10.1.2: Number of active users	20 000	6 months after the platform release	Data will be provided by the website administrators
Activity 2.11.1: Neighbourhood car sharing	New application / web platform for car sharing	Monitoring indicator 2.11.1.1: Percentage of users on the platform of all residents the platform can serve	8%	6 months after the platform release	Data will be provided by the application/website administrators
		Monitoring indicator 2.11.1.2: Frequency	At least 10 per week	6 months after the platform release	Data will be provided by the application/website administrators

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
		of car rides through the platform			
Activity 2.12.1: Integrated tariffs and common charging model across mobile services	A charging system for integrated tariffs and common charging model across mobile services	Monitoring indicator 2.12.1.1: Number of mobile services supported by the system	5	At the time of release	System administrators
		Monitoring indicator 2.12.1.2: Number of people using the system	10 000 daily users	6 months after the platform release	System administrators
Activity 3.1.1: Digital and physical space for start-ups located in Sofia	Online platform offering consultations and training to start-ups	Monitoring indicator 3.1.1.1: Number of e-services on the platform	5	At the time of release	Data will be visible from the website
		Monitoring indicator 3.1.1.2: Number of start-ups that have used the platform (cumulative)	60	6 months after the platform release	Data will be provided by the website administrators
Activity 3.4.1: Promotion of Sofia as a risk investment destination	A report with identified sectors in Sofia with high potential for risk investment	Monitoring indicator 3.4.1.1: Number of promotional events held/attended	10	1 year after the report completion	Activity managers
		Monitoring indicator 3.4.1.2: Amount of funding for risk	Collect information from Bulgarian Venture Capital Association, the	3 years after the report completion	Collect information from Bulgarian Venture Capital Association, the Fund of

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
		capital available in Sofia	Fund of Funds and conduct a research		Funds and conduct a research
Activity 3.5.1: International university for advanced digital skills and entrepreneurship	Developed concept for attracting an international university and students and identified potential locations	Monitoring indicator 3.5.1.1: Developed concept (yes/no)	Activity managers	6 months after the start of the activity	Activity managers
		Monitoring indicator 3.5.1.2: Number of international universities interested to create courses in Sofia	3	3 years after the concept development	Activity managers

Appendix III: Relevant Good practices

Community

Sofia is the second fastest-growing tech hub, by year-on-year growth of active members of tech-related meetup groups. Various professional organisations like BVCA, ABLE, BESCO, Bulgarian association of Business Angels, CEO Angels Club, Move.bg, Founder's Institute, etc. start-ups, accelerators and tech meet-ups invigorate the eco-system. Start-up Navigator is a platform mapping the entrepreneurial eco system in Sofia. Multilateral partnerships in the technology sector and development of digital platforms like dev.bg with the purpose to facilitate the tech job market can be used for career advice, professional consultation, job search with granular detailed parameters, recruitment.

Digital skillset

Software schools and academies – over 15 private software schools and academies operate in Sofia providing digital skills as coding, digital marketing, IT sales and project management to the general public with the potential of employment in the ICT sector in Sofia.

Bulgarian Centre of Training Firms, an affiliated member of the Worldwide Network of Practice Enterprises EUROPEN PEN International utilises learning-by-doing' methodology and innovative environment for high-school students to learn skills as business administration and soft skills while "creating" a training company, that undergoes the real process of a company registration in the country in a digital environment. As of January 2019, there are 241 training firms created by high school students all over the country.

Finance

After a financing gap of about EUR 110 million between the potential demand of SMEs for micro-financing and supply from existing schemes was identified by JEREMIE Gap analysis. VC and angel investor funding was not developed and start-up relied primarily on own finances. Based on these findings, as well as evidence of failure in the markets to offer financial products addressing these needs, the managing authority (the Ministry of the Economy) dedicated Priority Axis 3 'Financial resources for developing enterprises' of the OP 'Development of the Competitiveness of the Bulgarian Economy' 2007-2013 to improving access to finance for SMEs, including high-risk innovation-related investments. The managing

authority sought to finance 'niches', where traditional bank finance would not offer sufficient financing or would simply refuse to finance. Based on this analysis, the managing authority initially allocated BGN 390 million (EUR 199 million) for financial engineering instruments under the JEREMIE Initiative to be implemented through setting-up a holding fund5 with EIF appointed as a holding fund manager. The overall budget for financial instruments in the OP was increased to BGN 682.57 million (EUR 349 million) in 2012, following a decision of the managing authority to implement a Funded Risk Sharing Product on the basis of the updated market analysis from 2011. The funding agreement for implementation of the JEREMIE Initiative in Bulgaria between the managing authority and the EIF was signed in 2009 with an initial budget of EUR 199 million. The JEREMIE Acceleration and Seed instrument, as a part of the JEREMIE Holding Fund's equity compartment, was set up with an allocation of BGN 41 million (EUR 21 million) of programme resources and a BGN 0.41 million (EUR 0.21 million) commitment from the fund managers. A total of 85% of the public financing, i.e. EUR 17.85 million, is provided through the ERDF. The JEREMIE Holding Fund using the OP resources is the only investor in the instrument apart from the required management team commitment of 1% (EUR 0.21 million). As holding fund manager appointed by the managing authority, the EIF selected the funds Eleven and LAUNCHub through a competitive procedure that included eleven candidates. Each manager would manage the acceleration and the seed parts of the Acceleration and Seed instrument, but with a different focus, which lead to the creation of a developed start-up eco system.

Governance and leadership

Sofia Tech Park is the first tech park in the country. It is run by the Bulgarian government. Sofia

Tech Park aims to support the development of the research, innovation and technology capacity of the country. It includes a vast laboratory complex, an innovation forum, an interactive children's centre TechnoMagicLand, and an incubator for innovative companies.

Sofia Development Association was established in 2010 as part of Sofia Municipality. Sofia Development Association launched Sofia Innovation Lab (SofiaLab) in September 2018. SofiaLab focuses on the two thematic/sectoral priorities set in Sofia Smart Specialisation Strategy and key to the city innovation ecosystem: Informatics and ICT and new technologies in the creative and recreative industries. One of the main goals of SofiaLab is to increase digital skills in the city. Sofia Development Association also organises several hackathons annually.

As a result of the Strategy for Digital Specialisation of Sofia adopted in 2015, the Municipality created Sofia Investment Agency, which manages several digital projects for the city of Sofia, including the Digital Cities Challenge.

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Appendix V: Stakeholders consulted

Name	Organisation
Adrian Nikolov	The Institute for Market Economy
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Angelina Todorova	Fund of Funds
Anna Naydenova	ICT Cluster
Boris Marinov	Move.bg
Borislav Panayotov	SOFIA MUNICIPALITY
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Desislava Katsarska	Fund of Funds
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eng. Dimitar Petrov	Traffic Management and Analysis Department, Sofia Municipality
Evgeni Galabov	IRZet Solutions
Georgi Penchev	VISION FOR SOFIA
Gyurgitsa Kostadinova	Software Group
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Ivana Vachkova	Upnetix
Kaloyan Karamitov	VISION FOR SOFIA
Konstantin Georgiev	Transport Department, Sofia Municipality
Krasimira Shindarova	ICT Cluster
Ludmila Malcheva	Right Image
Lyubo Georgiev	SofProect
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Nikolay Penov	ICB
Nikolay Stoynev	SOFIA MUNICIPAL COUNCIL
Petar Mihaylov	Fund of Funds
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Stelian Dimitrov	Geographica
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