

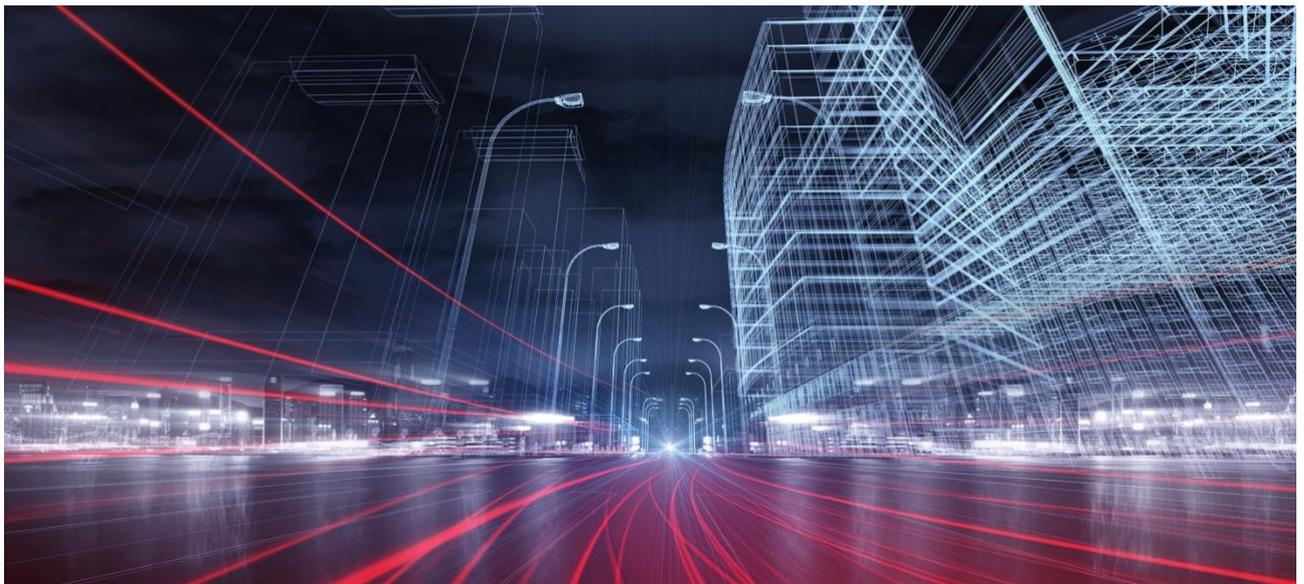


DIGITAL CITIES CHALLENGE

Digital Transformation Strategy for the city of Patras

PATREUS: PATRas E-city Urban Strategy

July 2019



Digital Cities Challenge

Digital Transformation Strategy for the city of
Patras: PATREUS: PATRas E-city Urban
Strategy

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Executive Summary: Patras digital transformation

Patras a central node in the Digital Cities Challenge network

The Digital Cities Challenge, an initiative of the European Commission, helps achieve sustainable economic growth in Patras through the integration of advanced technologies. The initiative fosters complementarities and synergies between existing policies involving digital priorities, namely economic development, smart specialisation, smart city and the newly planned policy actions supporting digital transformation.

The ambition is that Patras will act as model for other Greek 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 digitalisation. It will showcase how to fill the gaps which are currently hindering Patras to advance and capture the benefits of digital transformation.

The digital transformation strategy for PATREUS

The City of Patras has limited resources and autonomy for a digital strategy but a thriving research and education system. In policy terms, digital transformation adapts to and benefits from the National Digital Strategy and the Regional Operational Programme (ROP) /Smart Specialisation Strategy of the Region of Western Greece. The Municipality of Patras could, as yet, ensure some funding from the ROP to improve digital services to its citizens. *What is unique about Patras is the significant size and high quality of its Higher Education Institutions and Public Research Centres endowing the city with valuable human capital and implementing a large number of research and innovation pilot projects. PATREUS is about transforming this potential into entrepreneurship and competitiveness.*

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

“The vision of Patras is to become a smart digital city with the aim to improve the living conditions of its citizens, professionals and visitors through the active involvement of its human resources, through innovative initiatives by academic and research institutes and by the business sector, taking advantage of the opportunities offered by the development of next-generation networks”.

In order to reach this goal, the following ambitions were adopted in agreement with all stakeholders:

1. To exploit and strengthen broadband infrastructures, new generation networks and computing capabilities

For Statement 1 the underlying rationale relates to the opportunities offered by the 5G Pilot (if eventually starting), the existence and the possibilities offered by the existing MAN and its improving activation and in particular the opportunities that will be offered for the digital transformation to more actors if fibre to home by providers will help universal reach. Addressing the whole process strategically and with a shared vision will help speeding up the process and overcome bureaucratic hurdles (delays in decision-making, overlap or lack of clarity of responsibilities at the national, regional and city level etc.), and stimulate economic growth through new opportunities for entrepreneurship and increasing efficiency of the public sector.

2. To enhance sustainable urban development in Patras through the implementation of large-scale cutting-edge technologies

For Statement 2 the underlying rationale relates to the opportunities to activate citizens and businesses through larger scale projects that can have a visible impact. This can increase the visibility of the digital transformation process, while creating opportunities for local companies to both participate as users and as producers of applications of digital technologies. This may present a possibility to launch innovative public procurement calls, possibly with joint calls between DCC cities, in particular in the cases of sustainable energy and waste management.

3. To provide digital infrastructure, services and content to citizens and businesses quickly, easily, everywhere

For Statement 3 the underlying rationale relates to the need to support and activate the business sector and create new tools offered by the regional administration¹. Incumbents are lagging behind in terms of exploiting the opportunities offered by digital technologies, hence the offer of both infrastructure and services is expected to mobilise incumbents and help them overcome the small size of the local market as well as problems of access to finance. This is considered to be the best way to address the de-industrialisation trend tormenting the city in the last decades.

¹ The city itself has very feeble means to support the digital transformation. It responds to calls and implements activities funded by Regional, National or EU funds

4. To adopt ICT solutions for making Patras a pole for citizens' culture, visitors' attraction and tourists' destination

For Statement 4 the underlying rationale is connected in particular to the quality of life of citizens and tourists. As the tourism industry constitutes one of the main economic pillars with significant growth prospects a direct economic benefit is expected. Thematic tourism and promotion of local products will be opportunities to help in this direction.

The roll-out of this strategy will be guided by the implementation of six operational objectives (numbered sequentially based on the Ambition Statement to which they are connected):

- 1.1: Create pilot projects for businesses, including pilot networks of open digital infrastructures and services supporting research, innovation and entrepreneurship.
- 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment.
- 2.2: Support actions of smart management and smart applications in public buildings and public spaces.
- 3.1: Exploit and expand open datasets e.g. Geographic Information System data as a decision-making tool available on the Internet of all GIS-enabled systems free of charge.
- 3.2: Promote the development of digital culture in state-of-the-art technologies e.g. cloud computing, high volume data and educate students and young entrepreneurs on the use and needs in order to increase added value.
- 4.1: Support ICT applications related to thematic tourism.

The strategy roadmap for the city of Patras

Stakeholders have identified a list of activities in process or to be implemented in the short, medium and long term, in order to make its strategic mission and ambition a tangible reality. As such, a total of 27 specific activities were suggested, under the different operational objectives of the strategy. Examples of key activities to be implemented as part of the strategy include:

- Deployment, Operation and Management of IoT network with scalability and interconnectivity requirements with other IoT networks in the city comprising Dialog sensor platform.

- Development of smart mobility solutions for smart parking, real-time traffic conditions and smart bus stops.
- ESMARTCITY – Enabling Smarter Cities in the MED Area through Networking.

These three pilot activities were identified as the pilot activities for immediate implementation, kickstarting the implementation phase of the digital transformation strategy and generating immediate results.

The outlines of the governance of the digital transformation strategy suggested in the PATREUS context include the creation of a Steering Committee encompassing all stakeholders, ad hoc advisory committees (as need arises) to technically support the Steering Committee starting with a Group on Open Data, the maintenance of an open information platform ensuring up-to-date information on all projects implemented in the city, while a special role for enhancing entrepreneurship is entrusted to the Smart City Innovation Hub. In such a scheme Strategy Ownership will be common while steering and oversight composed of a mix of a Steering Committee and Working Groups will forge consensus and ensure implementation synergies. Its major advantage lies in the recognition of autonomy of individual actors and its light nature not requesting a budget line, which would be an inhibiting factor under the current public policy austerity circumstances all over Greece. 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 on 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 Patras. 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 Patras

A separate assessment report has been produced for the city of Patras as part of the Digital Cities Challenge. The overview of this assessment reveals a city, which has a rich research and education system but its economic performance is in decline for structural reasons exacerbated by the recent Greek economic crisis. Only few large, internationally competitive companies are located in the region, the overwhelming majority being SMEs and microenterprises producing non-tradable goods and services. The digital transformation is obviously not among their priorities.

However, digital maturity is higher than in other Greek cities thanks to the three HEIs and the autonomous research centres in the city educating thousands of students and undertaking state-of-the-art research. The retention of these students is low, partly because they return to their cities of origin but most importantly because there are limited local job opportunities in the city. The large population of graduates and the success rate of the research and educational system in externally funded projects (mainly at the national and European level and to a lesser extent business cooperation) has generated an ecosystem of start-ups, potential start-uppers and intermediaries envisaging the regeneration of the economic tissue.

An advantage for activating the local community is the extensive and inclusive effort for the creation of a *Smart City Strategy*, an initiative of a local university team, which has paved the way for stakeholder discussions and priority settings. Conversely, a main barrier for any Smart or Digital Strategy to be implemented, arises from the very low budget of the City Council, its reluctance to formally adopt strategic documents (the Smart City Strategy endorsed by all stakeholders almost two years ago has not yet been adopted as a formal city strategy) and the minimal funding resources of the Municipality. Private funding (including the capital markets and the banking system) is marginal, still suffering from the severe Greek recession.

3. Mission and Ambition statements

Mission statement:

The City of Patras has limited resources and autonomy for a digital strategy but a prosperous research and education system. In policy terms it adapts to and benefits from the National Digital Strategy and the Regional Operational Strategy /Smart Specialisation Strategy of Western Greece. Patras could as yet ensure some funding from the latter to improve digital services to its citizens. *What is unique about Patras is the significant size and high quality of its Higher Education Institutions and Public Research Centres endowing the city with valuable human capital and implementing a large number of research and innovation pilot projects. PATREUS is about transforming this potential into entrepreneurship and competitiveness.*

The Vision/mission was agreed with all stakeholders in a consultation process. Alternative ideas were then put together and discussed in the Vision and Ambition Workshop. The proposals by the core team were slightly amended to conclude with the following mission statement: *„The vision of Patras is to become a smart digital city with the mission to improve the living conditions of its citizens, professionals and visitors through the active involvement of its human resources, through innovative initiatives by academic and research institutes and by the business sector, taking advantage of the opportunities offered by the development of next-generation networks”.*

This mission statement was then further elaborated and refined to include four ambition statements:

Ambition statements

1. To exploit and strengthen broadband infrastructures, new generation networks and computing capabilities

For Statement 1 the underlying rationale relates to the opportunities offered by the 5G Pilot (if eventually starting), the existence and the possibilities offered by the existing MAN and its improving activation and in particular the opportunities that will be offered for the digital transformation to more actors if fibre to home by providers will help universal reach. Addressing the whole process strategically and with a shared vision will help speeding up the process and overcome bureaucratic hurdles (delays in decision-making, overlap or lack of clarity of

responsibilities at the national, regional and city level etc.), and stimulate economic growth through new opportunities for entrepreneurship and increasing efficiency of the public sector.

2. To enhance sustainable urban development in Patras through the implementation of large-scale cutting-edge technologies

For Statement 2 the underlying rationale relates to the opportunities to activate citizens and businesses through larger scale projects that can have a visible impact. This can increase the visibility of the digital transformation process, while creating opportunities for local companies to both participate as users and as producers of applications of digital technologies. This may present a possibility to launch innovative public procurement calls, possibly with joint calls between DCC cities, in particular in the cases of sustainable energy and waste management.

3. To provide digital infrastructure, services and content to citizens and businesses quickly, easily, everywhere

For Statement 3 the underlying rationale relates to the need to support and activate the business sector and create new tools offered by the regional administration.² Incumbents are lagging behind in terms of exploiting the opportunities offered by digital technologies, hence the offer of both infrastructure and services is expected to mobilise incumbents and help them overcome the small size of the local market as well as problems of access to finance. This is considered to be the best way to address the de-industrialisation trend tormenting the city in the last decades.

4. To adopt ICT solutions for making Patras a pole for citizens' culture, visitors' attraction and tourists' destination

For Statement 4 the underlying rationale is connected in particular to the quality of life of citizens and tourists. As the tourism industry constitutes one of the main economic pillars with significant growth prospects a direct economic benefit is expected. Thematic tourism and promotion of local products will be opportunities to help in this direction.

² The city itself has very feeble means to support the digital transformation. It responds to calls and implements activities funded by Regional, National or EU funds

4. PATREUS is about transforming this potential into entrepreneurship and competitiveness: the Digital Transformation Strategy for the city of Patras

4.1. Strategy orientation

What is unique about Patras is the significant size and high quality of its Higher Education Institutions and Public Research Centres endowing the city with valuable human capital and implementing a large number of research and innovation pilot projects. This vibrant activity of individual projects can lead to the creation of commercialisable knowledge, scale up of existing companies and creation of new ones, thus improving entrepreneurship and competitiveness. Tourism and ICT are the key sectors addressed; the former as a rich source of income expected to scale up and improve, the latter as a nucleus of new activities expected to take off through the digital transformation.

There are no explicit existing digital transformation strategies at the city level, there are, however, connected initiatives that help shape DCC:

- A Smart City Initiative, addressing in particular technical aspects, is an agreement between stakeholders but has not (yet) been officially approved by the City Council. The Smart City and Digital City strategies are compatible and will reinforce each other, once formally adopted by the City Council.
- The National Digital Strategy (NDS) 2016-2021, which encompasses the development of New Generation Networks, the acceleration of the digital economy, business development and employment in ICT, skill development, radical reforms of the digital public services, diffusion of the digital economy and security. This strategy constitutes an opportunity for funding for all Greek cities and regions; however, it occasionally hampers rapid administrative decision making, as all major initiatives need to ensure compatibility and interoperability with the national administration and may need to wait until nationwide projects are adopted.

- The Regional Operational Programme of Western Greece (ROP WG) and the connected Smart Specialisation Strategy (RIS3), where Patras plays a prominent role. RIS3 foresees a focus on the agro-food complex, tourism and materials-microelectronics (including software). The ROP WG identifies the low penetration of the digital economy as a major challenge for the region. The ROP is a major source of public funding for PATREUS.

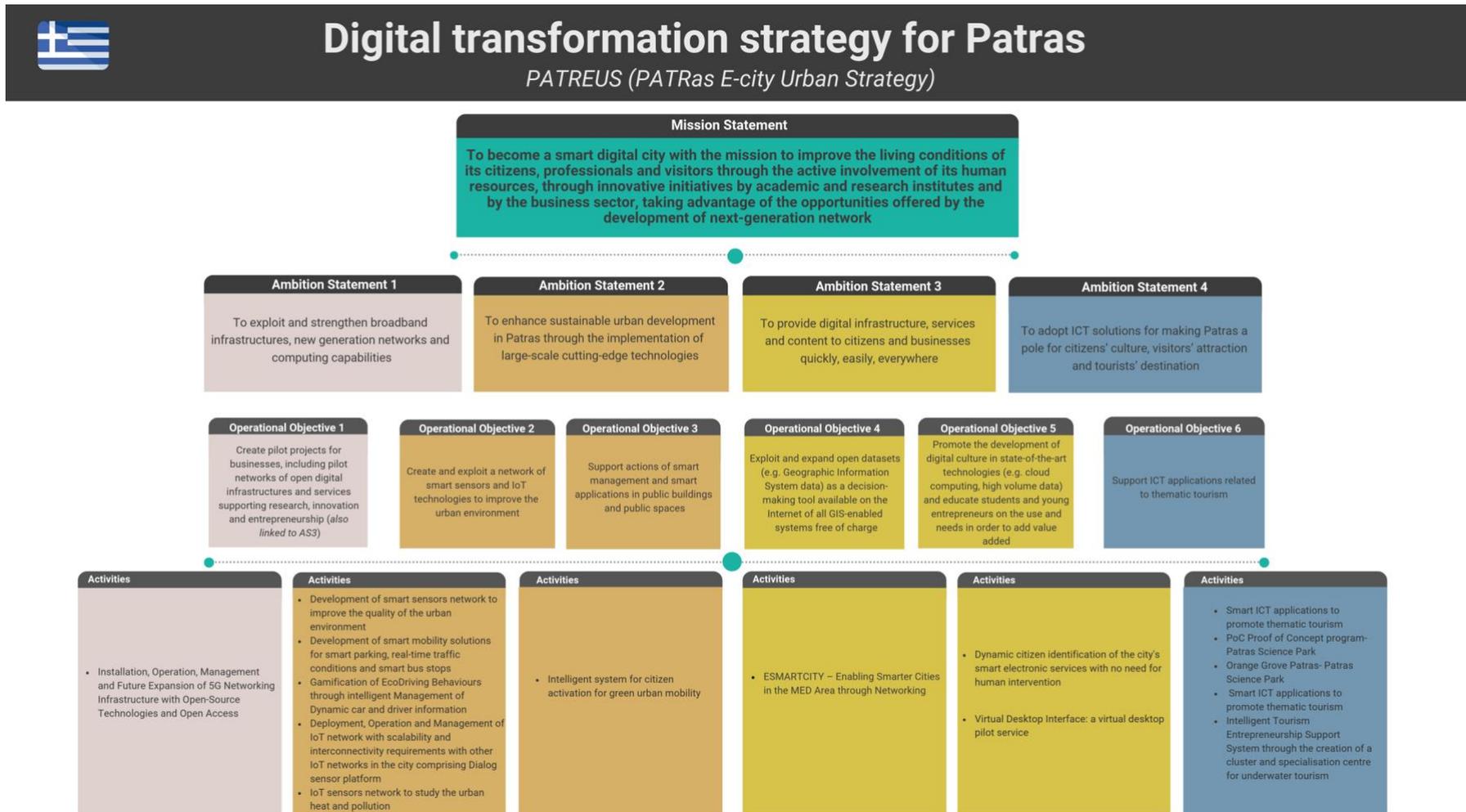
In this context the strategic objectives of the DCC avoid overlapping with the NDS, which will take care of the broad architecture of public services and focus on the local value added, extension of the Fibre Optic Network, 5G and its utilisation by local companies. The focus is on sectors that are relevant for the local economy, namely tourism, food industries and emerging high-tech areas, in particular ICT start-ups and incumbents. In this spirit DCC is fully compatible with the RIS3 and hopes to benefit from the few financial incentives that will still be offered during the current programming period by the ROP WG. DCC Patras suggests focusing on the co-evolution of skills and infrastructure and expects green spill overs to contribute to major improvements in the quality of life of the citizens and at the same time create new business opportunities.

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

	NDS	ROP WG and RIS3
Overlap avoidance	Major nation-wide public services	Fully compatible; ROP offers funding to the city
Potential for synergies	Access to financial opportunities for private investments	Access to financial opportunities for public services
Economic development and competitiveness	Focus on business opportunities, start-up developments and skill development both for specialised services and the general public	

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

Figure 1 Overview of the Digital Transformation Strategy for the City of Patras



4.2. Operational objectives

Operational objectives reflect the means through which the city of Patras 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 **Error! Reference source not found.** operational objectives are linked to one or several ambition statements. The city of Patras has identified 6 (six) operational objectives for its digital transformation strategy.

The four ambition statements presented in Section 3 were described in more detailed and translated into “potential” operational objectives of relevance for the region. A total of eleven possible operational objectives were discussed in a workshop where all local stakeholders were invited:

1. Expansion and utilisation of the Optical Fibre Network of the Municipality of Patras to private operators.
2. Expansion and exploitation of the Fibre Optic Network Municipality of Patras to public entities including utilities.
3. Maximise synergies with the National Public Administration Digital Infrastructure (Syzeftis II).
4. Establish pilot projects for business use, including pilot networks of open digital infrastructures and services to support research, innovation and entrepreneurship.
5. Create and utilise a network of smart sensors and IOT technologies to improve the quality of the urban environment (transport, waste management, etc.).
6. Support smart management and intelligent actions in public buildings and public spaces.
7. Exploit and expand open data sets (e.g. Geographic Information Systems’ data) as decision-making tools with open access.
8. Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, big data) and train students and new entrepreneurs on how to use and add value.
9. Support spin-offs based on open data.
10. Select and support ICT applications to promote thematic tourism in Patras.
11. Marine archaeology.

The criteria used for prioritisation were the expected impact and the difficulties of implementation. An interactive process was followed:

1. At a first stage the potential operational objectives were explained by the core team and discussed with all participants in the workshop. After the discussion participants were asked to use post-its and assign a value of 1-10 for
 - the relevant dimensions of potential impact and
 - easiness of implementation.
2. The results were combined and presented in a two-dimensional diagramme, which helped identify which potential operational objectives should be prioritised.
3. The priorities were then discussed in more detail, refined and re-edited.
4. The results were put together in a draft paper, which was distributed by mail to the participants for comments. Few only came back with additional ideas, details and clarifications, which led to the final document, distributed again to all stakeholders. No further reactions were registered so the six priority Operational Objectives (OO) presented below were adopted.

Based on these criteria and process the six operational objectives presented on Table 1 were selected as the most promising and comparatively easy to implement. Their merits lie in local experience, partly ensured financial resources in existing instruments and their degrees of freedom, as they are not constrained by higher level regulatory requirements.

The five Operational Objectives, which were not selected as priorities, are important and created positive expectations but had to be eliminated at this stage because of significant difficulties of implementation triggered by financial or regulatory constraints.

The selected Operational Objectives, numbered in a way to reflect their link to the Ambitions (first digit) and then sequential (second digit) are presented on Table 1 below:

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

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

Operational objectives and description	Link to ambition statements and key city challenges and opportunities	Key Success Factors
OO 1.1: Create pilot projects for businesses, including pilot networks of open digital infrastructures and services supporting research, innovation and entrepreneurship	Linked primarily to ambition statement 1 (as well as 3)	Agreement with the Ministry for the implementation of 5G, local co-ordination, provision of resources, adoption of a clear and friendly HEI framework, funding of start-ups, easy access to seed capital
OO 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment	Linked to ambition statement 2	Maturity of projects and technology solutions, privacy and data security issues, ensuring their use and sustainability, funding, ensuring monitoring and managing any network that can be integrated into this objective
OO 2.2: Support actions of smart management and smart applications in public buildings and public spaces	Linked to ambition statement 2	Funding, linking to government procurement to promote the selection of projects based on the total cost of a commission and not just the initial investment cost
OO 3.1: Exploit and expand open datasets (e.g. Geographic Information System data) as a decision-making tool available on the Internet of all GIS-enabled systems free of charge	Linked to ambition statement 3	Regulatory framework for free and open access of data by open systems, governance, funding, taking a relevant decision at Municipality level
OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added	Linked to ambition statement 3	Funding, adoption of a corresponding culture by HEIs, information for citizens and businesses, pilot applications
OO 4.1: Support ICT applications related to thematic tourism	Linked to ambition statement 4	Funding, engaging with the public, government, business and academia to create relevant applications and content.

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.

5.1. Overview of proposed activities

The digital transformation strategy for the city of Patras will be implemented through a group of activities, identified in the framework of the Digital Cities Challenge. Activities are meant to contribute to reaching the operational objectives defined in the framework of the strategy, which in turn will contribute to the city's ambition and mission. The list of priority activities may be expanded over time. For now, the city has decided to implement 13 (thirteen) activities, as described in the following table. The criteria used were maturity and easiness of implementation (combined into "feasibility" on Appendix I), impact and sustainability (combined into "priority" on Appendix I). For maturity we used the ensured financial resources (project already started, or resources committed for the specific activity and the individual partner proposing it).

The following activities are prioritised. The additional 14 activities proposed, which were not selected in priority, are nevertheless reported in Appendix Ib, because they are expected to be maturing over time and they would constitute important ideas for updating the strategy.

The numbering is again following a tree-structure logic: each activity is awarded to one operational objective, hence the first two numbers refer to the objective, the third is sequential:

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
Activity 1.1.1: Installation, Operation, Management and Future Expansion of 5G Networking Infrastructure with Open-Source Technologies and Open Access	1.1	Smart City Innovation Hub in cooperation with INTRACOM (large national ICT company)	Create an open 5G-based smart city digital infrastructure that will enable the formation of a research and innovation ecosystem taking advantage of the highly competent class of people in the area. There will be Outdoor base stations to provide 5G and IoT coverage at locations of interest (where ICT19 vertical pilots will be enabled) both in the Patras campus and in the wider areas.
Activity 2.1.1: Development of smart sensors network to improve the quality of the urban environment	2.1	Municipality of Patras	The creation of a distributed network of smart sensors that can measure many parameters for more effective management of the Historic City Centre (addressing environmental data, i.e. air pollution, radiation etc and ensuring open data access).
Activity 2.1.2: Development of smart mobility solutions for smart parking, real-time traffic conditions and smart bus stops	2.1	Municipality of Patras	Promote sustainable urban mobility by implementing smart solutions for the collection, processing and distribution of traffic data via multiple channels of real-time communication. Develop intelligent city solutions to inform residents and visitors of the centre of Patras for parking places, traffic and smart stops
Activity 2.1.3: Gamification of EcoDriving Behaviours through intelligent Management of Dynamic car and driver information	2.1	HORIZON Consortium with the participation of the University of Patras	GameCAR aims to develop a highly innovative and interactive Serious Games platform that will empower and guide users to adopt an eco-friendly driving style. The data collection and platform will help reduce greenhouse gas.
Activity 2.1.4: Deployment, Operation and Management of IoT network with scalability and interconnectivity requirements with other IoT networks in the	2.1	Smart City Innovation Hub	The Smart City of Patras IoT network aiming to connect 10000 sensors of various types is expected to cover the whole city area and enable utilisation in various cases (for example the Safety Use case). The Patras ecosystem will gain significant knowhow on

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
city comprising Dialog sensor platform			the design, implementation and maintenance of IoT in real time; data will be open
Activity 2.1.5: IoT sensors network to study the urban heat and pollution	2.1	Laboratory of Atmospheric Physics of the University of Patras	On-Line devices for On-Line monitoring of the network of temperature and humidity measuring stations to capture the urban heat island phenomenon will improve to measure quantities in near real time, so that it is possible to check its good functioning and to keep the audience informed.
Activity 2.2.1: Intelligent system for citizen activation for green urban mobility	2.2	University of Patras (Department of Civil Engineering)	The project aims at creating an intelligent system of rewarding citizens for more efficient use of public transport in order to reduce ecological footprint in urban transport by creating a "green" application in a desktop environment and smart portable devices
Activity 3.1.1: ESMARTCITY – Enabling Smarter Cities in the MED Area through Networking	3.1	Industrial Systems Institute (I.S.I.) Region of Western Greece	The project is related to the pilot testing of Smart City's ideas in the building environment (energy management, IoT, services) and will explore the role that open system / data adoption can play in increasing business innovation and boosting entrepreneurship through the provision of new systems / services exploiting existing infrastructures.
Activity 3.2.1: Dynamic citizen identification of the city's smart electronic services with no need for human intervention	3.2	University of Patras (Department of Computer Engineering & Informatics)	The activity addresses interoperability of services with authentication and citizen identification providers securely. It is particularly relevant for the services for tourism and culture activities
Activity 3.2.2: Virtual Desktop Interface: a virtual desktop pilot service	3.2	Computer Technology Institute & Press Diophantus (Directorate of Pan-Hellenic School Network and Network)	The VirtualDesktopInterface-VDI infrastructure provides a personalised desktop that the user (student or teacher in the case of Education) can access from any workstation with an Internet

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
		Technologies), the Chamber of Commerce of Achaia or another representative of companies	connection. For schools, VDI technology will ensure the easy creation and operation of workshops tailored to the needs of the courses and will offer quality access to e-learning and governance services and digital educational content.
Activity 3.2.3: PoC Proof of Concept program- Patras Science Park	3.2	Patras Science Park	<p>Patras Science Park “Proof of Concept” Program aims to empower researchers to push forward their ideas and turn them into a product. The objective is to bring innovations to the commercialisation stage through:</p> <ul style="list-style-type: none"> - Licensing procedures for a new or existing company, or - Financing a start-up company by venture capital, taking into consideration the nature of the idea, the potential of the market and the plan of the inventors. Innovations that will mature will be channelled to investors but also to social and environmental stakeholders, including social entrepreneurs, volunteers and non-profit organisations.
Activity 3.2.4: Orange Grove Patras- Patras Science Park	3.2	Patras Science Park	<p>Orange Grove Patras is a flexible workspace and incubator for young entrepreneurs aspiring to become a catalyst for the development and growth of the local startup ecosystem in the area of Western Greece. At OG Patras young entrepreneurs will find assistance, cooperation, mentoring and inspiration to form innovative and successful startups, capitalising on the unexploited opportunities of this area and beyond (human capital, geographic location, infrastructures). Other than a business incubator and mentoring program, Orange Grove offers training and educational programs and the opportunity for the participants to participate in numerous networking events.</p>

Activity name	Link to Operational Objectives	Main implementing partner (i.e. owner of the activity)	Brief description and goals
<p>Activity 4.1.1: Smart ICT applications to promote thematic tourism</p>	<p>4.1</p>	<p>Municipality of Patras</p>	<p>The project concerns the promotion of thematic tourism through ICT applications at the Historic Centre of Patras. The Act will provide effective navigation of visitors and citizens by providing tourist and cultural information, exploiting services that exploit spatial data, while also providing the opportunity to present information about Patras points of interest using QR tag technology.</p>
<p>Activity 4.1.2: Intelligent Tourism Entrepreneurship Support System through the creation of a cluster and specialisation centre for underwater tourism</p>	<p>4.1</p>	<p>University of Patras (Department of Civil Engineering)</p>	<p>The proposal aims at making full use of the assets of the natural and cultural heritage of the seabed in the city of Patras, promoting a viable and responsible way of mapping, valuing and protecting this wealth. Innovative tools and solutions such as underwater ROVs, AUVs, technologies offering 3 dry diving experiments etc. will be used.</p>

5.2. The pilot activities

In order to begin the implementation of the strategy, the city of Patras has decided to carry out three pilot activities. All three were selected because funding is ensured, the partners are reliable and, in a position, to complete the activity and ensure its sustainability. They promote open data ideas and help improve local skills. The following tables describe them in more detail:

ESMARTCITY – Enabling Smarter Cities in the MED Area through Networking	
Link to operational objective	OO 3.1 – Exploit and expand open datasets (e.g. Geographical Information System data) as a decision-making tool with disposal on the Internet of all GIS-enabled systems free of charge
Description	<p>Objective: The activity intends to improve Patras innovation capacity creating/enhancing innovation ecosystems involving quadruple helix actors. In this context the activity aims to enhance local clusters, mobilise the city and proactively involve the local community leading to an overall Innovation Policy Change transferable to policy makers. Pilot testing activities in Patras involve installation of IoT and energy metering infrastructure in public buildings following the Living Lab concept and making their datasets open under licence to interested stakeholders.</p> <p>Activities: During the project pilot testing phase utilisation of digital and energy saving technologies in public buildings will be sought, promoting open data / APIs scheme. The project will intervene in a number of public buildings (e.g. Industrial Systems Institute premises, Region of Western Greece buildings, schools in the area of Patras) creating energy efficiency and IoT infrastructure. Open datasets will be promoted and capacity building activities towards local SMEs and clusters will be performed. The lessons learnt will lead to a Green Paper on Innovation Policy Change that will be transferred towards local authorities.</p> <p>Targeted beneficiaries: Local SMEs and innovative clusters, public sector and policy makers, academia and research, general public.</p>
Timeframe	<ul style="list-style-type: none"> Length: 30 months Estimated date of implementation: Ongoing since February 2018
Estimated cost and source of funding	Total project budget 2,5 M€ of which 565 K€ are related to the pilot testing and transferring in Patras. Source of funding ERDF under Interreg MED programme
Feasibility	High: technologies are mature, there is user demand for solutions related to energy savings and efficiency in the building sector, in line with other local stakeholder initiatives such as Energy Consumption Observatory
Priority	High: promoting an innovation policy change towards open data / APIs and integrating the different pilots implemented by different stakeholders in the city can significantly enhance city innovation ecosystem allowing new services over the deployed infrastructure and ascertaining its lifecycle considerations
Organisation / unit in charge of delivery	Industrial Systems Institute and Region of Western Greece

Development of Smart Mobility Solutions for Smart Parking, Real-Time Traffic Conditions and Smart Bus Stops	
Link to operational objective	OO 2.1– Create and exploit a network of smart sensors and IoT technologies to improve the quality of the urban environment
Description	<p>Objective: The general objective of the project is to promote smart urban mobility by implementing solutions for the collection, processing and distribution of real-time traffic data via multiple channels. The project aims at integrating distinct systems and applications for the management of infrastructure but mainly for the efficient use of useful traffic information by the citizens.</p> <p>Activities: Smart mobility solutions will be developed for the real-time information of residents and visitors of Patras about available parking places, traffic conditions and smart stops of means of public transport. The system includes the installation of sensor networks, the development of subsystems' control software, a web-based administrator platform and a unified mobile application provided free to users. A significant key point is the development of an integrated administrator's platform for the operator's managers, which will receive data from subsystems' control software and provide online traffic data to citizens.</p> <p>Targeted beneficiaries: funding and implementation by the Municipality and contractor who will win the bid; vehicle drivers (residents and visitors), public transport operators, municipal staff (for city traffic supervision), municipal electives (for use of the system as a decision-making tool), scientists and researchers (processing of open data).</p>
Timeframe	<ul style="list-style-type: none"> • Length: 18 months • Estimated beginning date of implementation: Autumn of 2019
Estimated cost and source of funding	<p>Total project budget: 950 K€.</p> <p>Source of funding: Operational Programme of Western Greece (ERDF, National Funds)</p>
Feasibility	High: smart mobility solutions are mature, installation of sensor networks and administration procedures are under the responsibility of the Municipality, there is strong citizens' demand for real-time information related to available parking places and traffic conditions in the centre of Patras
Priority	High: there is strong citizens' demand for real-time information related to available parking places and traffic conditions specially in the centre of the city of Patras, significant improvement in the standard of living of citizens achieved through the prudent use of private cars and the exploitation of means of public transport, promotion of open data / APIs
Organisation / unit in charge of delivery	Municipality of Patras (ICT Directorate, Traffic Planning Directorate)

Deployment, Operation and Management of IoT network with scalability and interconnectivity requirements with other IoT networks in the City Comprising Dialog sensor platform	
Link to operational objective	OO 1.1 Create pilot projects for businesses, including pilot networks of open digital infrastructures and services supporting research, innovation and entrepreneurship
Description	<p>Objective: To establish an IoT network and the development of related data applications to enable citizen involvement by facilitating public services and delivering high quality admin service solutions. As part of the establishment of Patras open access IoT network (https://www.thethingsnetwork.org/) which currently deploys two IoT gateways that can interconnect over 10000 sensors of various types, Dialog together with the NAM group is looking into expanding this project.</p> <p>In Patras/Greece there will be IoT coverage at locations of interest. Part of this project comprises training activities from the technology providers (Dialog Semiconductor) to all interested parties. The involved partners together with the digital ecosystem will gain significant knowhow on the design, implementation and maintenance of IoT infrastructures and but also the development of open data applications and services. The latter will be achieved through open access to this digital infrastructure.</p> <p>Activities: The project involves the deployment of a number of Dialog Semiconductor (DS) IoT Multi Sensor Boards around the city. Also 5 Development Kits from DS (Dialog Semiconductor is the technology provider that offers the sensor kit and platforms) are offered to the Smart City Innovation Hub and the University of Patras. Training activities are being carried out through the Smart City Innovation Hub.</p> <p>Targeted beneficiaries: digital ecosystem and University students</p>
Timeframe	<ul style="list-style-type: none"> • Duration: 12 months/ •Already started
Estimated cost and source of funding	The project is funded by Dialog Semiconductor as far as the hardware and training is concerned and University of Patras as far as research and development personnel is concerned.
Feasibility	High
Priority	High: To design and deliver applications and services for the citizens that will be enabled by the data, to deliver innovation through experimenting with new sensors and “things”, Develop environmentally friendly policies based on the data collected
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Smart City Innovation Hub

5.3. Timetable for implementation

It is foreseen the strategy will be implemented for the next five years. Activities will be gradually implemented, on the basis of the following indicative timetable. Few crucial activities that have not yet ensured funding are presented without a concrete timetable.

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

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

Activity	Jan-Jun 2019	Jul-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022	Jul-Dec 2022	Jan-Jun 2023	Jul-Dec 2023	Comments
Activity 1.1.1: Installation, Operation, Management and Future Expansion of 5G Networking Infrastructure with Open-Source Technologies and Open Access											The activity spans 2 projects. 5GINFIRE started in 2017 and will end in July 2019, 5GVINNI started July 2018 and will end in July 2021.
Activity 2.1.1: Development of smart sensors network to improve the quality of the urban environment											The duration is 14 months; exact starting date is unknown.
Activity 2.1.2: Development of smart mobility solutions for smart parking, real-time traffic conditions and smart bus stops											The duration is 18 months; exact starting date is unknown
Activity 2.1.3: Gamification of											The activity finished on

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Activity	Jan-Jun 2019	Jul-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022	Jul-Dec 2022	Jan-Jun 2023	Jul-Dec 2023	Comments
EcoDriving Behaviours through intelligent Management of Dynamic car and driver information											December 2018 and its duration was 24 months.
Activity 2.1.4: Deployment, Operation and Management of IoT network with scalability and interconnectivity requirements with other IoT networks in the city comprising Dialog sensor platform											The activity is on-going since 2017. There is no information about the duration.
Activity 2.1.5: IoT sensors network to study the urban heat and pollution											The network installation has begun, and its duration is 24 months.
Activity 2.2.1: Intelligent system for citizen activation for green urban mobility											The duration is 36 months. There is no information about its start

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Activity	Jan-Jun 2019	Jul-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022	Jul-Dec 2022	Jan-Jun 2023	Jul-Dec 2023	Comments
Activity 3.1.1: ESMARTCITY – Enabling Smarter Cities in the MED Area through Networking											The activity is on-going, and its duration is estimated until middle 2020.
Activity 3.2.1: Dynamic citizen identification of the city's smart electronic services with no need for human intervention											The duration is estimated at 60 months, but we don't know when it starts.
Activity 3.2.2: Virtual Desktop Interface: a virtual desktop pilot service											The duration is estimated at 36 months, but we don't know when it starts.
Activity 3.2.3: PoC Proof of Concept program- Patras Science Park											No specific time-plan yet, but high-impact activity in the spirit of growth-enhancing digital transformation

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

Activity	Jan-Jun 2019	Jul-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022	Jul-Dec 2022	Jan-Jun 2023	Jul-Dec 2023	Comments
Activity 3.2.4: Orange Grove Patras- Patras Science Park											No specific time-plan yet, but high-impact activity in the spirit of growth-enhancing digital transformation
Activity 4.1.1: Smart ICT applications to promote thematic tourism											The duration is estimated at 8 months, but we don't know when it starts.
Activity 4.1.2: Intelligent Tourism Entrepreneurship Support System through the creation of a cluster and specialisation centre for underwater tourism											The duration is estimated at 36 months, but we don't know when it starts.

6. Strategy governance

Governance is the single biggest challenge for the digital transformation of the City of Patras, since its major weakness was identified to be the lack of coordination of very many competent individual actors with plenty of research projects, excellent human resources and a success track record in attracting competitive funding from within (Region of Western Greece, National Sectoral Operational Programmes) and outside Greece (FPs, Horizon and Interreg). The City Council, which would be the natural institution to design and oversee coordination faces at the moment significant barriers:

- Unlike in the case of the Smart Specialisation Strategy³ and the role of the regional authorities, city councils in Greece have limited autonomy both in terms of resources and in regulatory issues. Their budget is limited to operational expenses (declining in the recent past because of the adopted austerity policy) and it relies to a large extent on external, competitive funding for its investments. At the same time, even when the local administration wishes to take initiatives (e.g. as the case of teleconferences between local administration offices) the national authorities may block them in the spirit of proceeding centrally to ensure economies of scale and interoperability. For all Greek cities to join at the same time pioneers inevitably are held back. This often created significant delays in adopting even mature technologies.
- As there are municipal elections in May 2019 the City Council would be reluctant to endorse any strategy or governance schemes entailing long-term commitments.
- Earlier efforts for coordination (like the Smart City Strategy), encompassing initiatives by individual actors (as the Innovation Hub) and the accumulated networking of individual actors have created a successful, yet anarchic model of digital transformation. The fact that the City Council has not yet endorsed the Smart City Strategy and the persistent, successful efforts of individual actors have created a complicated environment of combined *individuality and discontent*.

³ Modelling governance based on the Smart Specialisation Strategy (S3) is not an option, since the S3 is linked to an ex-ante conditionality, whereas DCC is a purely voluntary exercise.

In this context it would be illusionary to expect an overall agreement for an encompassing, formal governance structure at this stage. Therefore, the governance scheme suggested is a result of individual discussions but cannot be expected to be endorsed until at least the next election and the establishment of the next City Council. The following elements of a mixed governance structure are proposed:

1. Once the City Council adopts the DCC PATREUS a “*PATREUS Steering Committee*” will be established chaired by the City Council with members from the three HEIs, the Research Centres involved, the Smart City Innovation Hub, the Technical Chamber and the Chamber of Industry and Commerce. In case the City Administration is for any reason not in a position to host and chair the Steering Committee the other members can be asked to take the lead. The role of the Steering Committee, which will convene regularly 3-4 times per year, will be to ensure the continuity and adaptation of the Strategy, discuss progress, identify gaps, point out potential synergies and endorse/support the individual projects, which will be part of its strategy. As budget requirements are a major impediment in the Greek administration it is suggested to create the Steering Committee without a budget provision, asking the members of the Committee to contribute in kind (e.g. the City can ensure rudimentary secretarial support, the Technical Chamber can offer facilities for the meetings, one of the institutes can create and maintain the platform). The same Steering Committee would monitor the Smart City Strategy and progress thus ensuring coordination of the two interrelated strategies. In case the City Council is not willing to take the Steering Committee under its auspices the Smart City Innovation Hub might be willing to do so. Decision making will be subject to voting (one vote per participant reflecting good governance principles) though an effort should be made to reach decisions in consensus (as it has always been the case during the DCC process). If the City Council wishes to have a veto right, this should be allowed to recognise its *primus inter pares* status.
2. The Steering Committee will, subject to requirements, create ad hoc committees to suggest new topics or solutions to emerging problems. The first such group is expected to be created immediately to address the strategy and policy regarding open data, namely strategic and policy issues linked to legal, organisational and technical aspects. All stakeholders participating in the Steering Committee will be asked to join adding also open data experts. Other ad hoc groups may be created to check the possibility

of creating a *City Innovate*⁴ type organisation that matches up start-up entrepreneurs and government agencies, a monitoring group to ensure evidence-based management (e.g. monitor via alumni associations the skill retention in the city) etc.

3. An open platform including details and progress of all Smart and Digital City projects is necessary for all stakeholders to be informed about the potential of utilising project results but also identify potential synergies. As long as all stakeholders agree to post their projects on the platform its maintenance will be easy. The Steering Committee will discuss with the HEIs and Research Institutes, who would be willing to take responsibility for the creation of the platform. Updating will be a common responsibility of all project implementing teams.
4. The Smart City Innovation Hub will take responsibility for identifying all entrepreneurship opportunities created by the strategy (public procurement, open data, funding opportunities) and regularly inform the ecosystem, while getting information from companies and feed-back to the Steering Committee.

In such a scheme Strategy Ownership will be ad hoc but steering and oversight composed of a mix of a Steering Committee and Working Groups will forge consensus and ensure synergies in implementation by independent agents.

⁴ [https://www.crunchbase.com/organization/city-innovate-foundation?utm_source=cb_daily&utm_medium=email&utm_campaign=20190111&utm_content=intro&utm_term=content&send_email=-Email-
&mkt_tok=eyJpIjoiWkrVeFpEQTFNVEkyT1RreilSnQiOilzSVZYNGM0aE51NXI0Z2h0M3ZCR0xLTFhnXC9kc3RUY2dtaFN3V2d4XC9yeHR0UUUFQOFhCRHQ5WIFCU1BtMIFPMzBJQmR3QmNPQTZMSTFVZmJQaFFkcnNLbTRxb2w1QUtFMHIXS1dHT1pFZ0VtcFJVbkRtQWEyT1hrbG5CSnJcL0plXC8ifQ%3D%3D](https://www.crunchbase.com/organization/city-innovate-foundation?utm_source=cb_daily&utm_medium=email&utm_campaign=20190111&utm_content=intro&utm_term=content&send_email=-Email-&mkt_tok=eyJpIjoiWkrVeFpEQTFNVEkyT1RreilSnQiOilzSVZYNGM0aE51NXI0Z2h0M3ZCR0xLTFhnXC9kc3RUY2dtaFN3V2d4XC9yeHR0UUUFQOFhCRHQ5WIFCU1BtMIFPMzBJQmR3QmNPQTZMSTFVZmJQaFFkcnNLbTRxb2w1QUtFMHIXS1dHT1pFZ0VtcFJVbkRtQWEyT1hrbG5CSnJcL0plXC8ifQ%3D%3D)

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 DCC 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 by the Municipality of Patras, assisted by the Steering Committee, 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.

The Steering Committee will be overseeing the data collection but, as presented in the corresponding table individual organisations will be in charge of collecting data on specific monitoring indicators. 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 the Patreus (Smart and Digital City) Steering Committee 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.

At this stage the aggregation from Activities to Operational Objectives and from there to Ambitions, as presented on Appendix II, has been conservative: it reflects aggregate indicators of selected activities only. Indicators for Operational Objectives and Ambitions will be adapted/increased as new activities will be designed in the 10-year horizon of the DCC strategy. Outcomes may double or even triple if sufficient financial resources are offered over the next programming period.

7.2. Strategy evaluation plan

In addition to monitoring the progress of strategy implementation, the Digital Transformation Strategy for Patras will undergo an internal evaluation within the next 2 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 the Municipality of Patras with the support of the Steering Committee. The idea of the evaluation, which is planned to be performed at the same time with the evaluation of the Regional Operational Programme (one of the funding sources of DCC activities) is to assess synergies between the project and outcomes. A Smart City – Digital City Platform will be created to be used for simple monitoring and internal mid-term reviews will be carried out annually by an ad hoc group of three members to be presented to the Steering Committee. At this stage there are no funds ensured for more demanding ex-post evaluations but an effort will be made to access funding for a comprehensive, portfolio evaluation in 2021.

An additional impact evaluation may be conducted after (6 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 and will always be posted in the SC-DCC Platform.

8. Results achieved and next steps

In Patras the scientific community and a small number of companies have been active in implementing projects related to digital transformation, partly in cooperation with the Municipality of Patras or the Region of Western Greece and partly independently. A Smart City Strategy was devised in 2017 but is not yet formally adopted by the City Council. The decision to apply for DCC membership was taken based:

- On the identification of ample success in funding competitive research projects, leading to a culture of individuality.
- On an increasing discontent of systematic information exchange among relevant actors.
- Wish to create synergies between existing and future projects as well as identifying gaps and opportunities leading to a roadmap that will enable to design and channel resources for the future.

The DCC participation has met the expectations of the stakeholders and has even exceeded them with the creation of a Steering Committee incorporating all stakeholders, which met for the first time on the 9th of April 2019. The topics of the agenda included the mission and organisation of the Steering Committee itself, the agreement that it would discuss both Digital and Smart City progress and information and positioning of the participants on the current DCC key issues (open data and monitoring indicators).

The immediate high-impact of the project was the decision taken in this first Steering Committee meeting to create a platform to monitor digital-transformation-related projects and initiatives, which would allow for synergies in the future (e.g. join sensor placements, data sharing) as well as potential of increased utilisation. As there are no funding sources directly available at the moment the Industrial Systems Institute of the ATHENA Research and Innovation Centre has volunteered to create and maintain the platform from internal resources, whereas all participants will take responsibility for feeding in information for their respective projects. This is a good practice that other DCC regions might like to take into consideration: informality helps quick progress on synergies without additional financial resources.

Another benefit of DCC was the contribution of the thematic expert on clarifying Open Data and Open Access problems, organisation and good practices. While at the level of the Municipality there was already an initial interest in progressing towards Open Data/Open Access principles, help was provided indicating standards and pilots plus getting concrete information and discussing alternative models, which were valuable for future decision making.

Throughout the project there was a fruitful exchange of ideas with cities with similar maturity levels such as L' Aquilla. During the 5th Academy Seminar, which took place on the 8th and 9th of April 2019 in Brussels, there was an exchange with Wave 2 and Fellow Cities on two ideas for collaboration among DCC cities. The first idea was on the area of Open Data and the creation of a common – possibly together with other DCC cities - platform. A common platform can trigger economies of scale, exchange of ideas leading to more appropriate solutions and can in addition encourage further collaboration with other DCC cities. The first sets of data that could be introduced on the platform could be published by Patras and be related to (a) sensors' measurements for environmental pollution and air quality and (b) urban mobility data (parking places and traffic data). The second idea for supporting entrepreneurship relates know-how transfer exhibition on start-ups. The annual Patras Innovation Quest (Patras IQ) has a history of 6 years building up a reputation for the city and attracting actors from the whole country. In such a context DCC Cities could organise City Labs and/or Hackathons where entrepreneurs, start-ups and supporting agencies can present ideas and solutions around common problems of the DCC Cities. This would take the form of a contest-like format led by the core of the DCC cities that are more mature in any specific area. As a final stage best practices or solutions around the DCC community could be presented in a DCC Hackathon in an effort to co-shape the digital transformation.

The community of people aware of the benefits and challenges of digital transformation is relatively small in the city and people knew each other but their exchange of information was fragmented and occasional. The workshops have enabled stakeholders to come together and better understand each other. Conversely, during the project the broader community and civil society could not be engaged. During the time and the discussions on DCC society has become more involved. Examples include the annual Patras IQ events, which are institutionalised, efforts by the intermediaries and numerous events are taking place around the City of Patras supporting young entrepreneurs such as BlueHackathon (April 2019 with 40 people <https://www.facebook.com/events/241436246664703/>) , ESTEEC Hackathon with IoT and Smart Campus applications (April 2019 with 40 people) and RestartUP per-incubator presented at Patras IQ (April 2019 with 16 people <https://www.patrasiq.gr/programme.php0> . More hackathons are expected, as the Esmartcity Hackathon on open datasets (July 2019)

The immediate next steps include the activation of the Steering Committee, with specific emphasis on monitoring the progress of activities reported in the DCC Roadmap, the identification of important gaps to be prioritised and the cooperation between the Municipality and the Region of Western Greece for the design of digital support measures in the next programming period, the implementation of the Platform and possibly the dissemination of the knowledge gained by Patras to other smaller cities in the region.

Appendix Ia: Detailed presentation of activities

Activity 1.1.1: Deployment, Operation and Management and future extension of open networking 5G infrastructure with open access	
Link to operational objective	OO 1.1: Create pilot projects for businesses, including pilot networks of open digital infrastructures and services supporting research, innovation and entrepreneurship
Description	The overall ambition is to create an open 5G-based smart city digital infrastructure that will enable the formation of a research and innovation ecosystem taking advantage of the highly competent class of people in the area (scientists, entrepreneurs, start-ups, public administrators, students, citizens etc), eager to keep up with the new international challenges of the digital society. This will be achieved in close collaboration with academic/ research organisations, the city/region authorities, and industrially driven innovation hubs or other public agencies. The 5G-VINNI facility in Patras/Greece will be an exemplary Open Source 5G-IoT facility. Numerous partners will deploy their technologies in the Patras/Greece facility, thus creating a unique 5G playground for KPI validation and support on future verticals. There will be Outdoor base stations to provide 5G and IoT coverage at locations of interest (where ICT19 vertical pilots will be enabled) both in the Patras campus and in the wider areas. The Patras ecosystem will gain significant know how on the design implementation and maintenance of networking and computing infrastructures.
Timeframe	<ul style="list-style-type: none"> Length: approximately 48 months Estimated date of implementation: The activity spans 2 projects. 5GINFIRE started in 2017 and will end in July 2019, 5GVINNI started July 2018 and will end in July 2021.
Estimated cost and source of funding	Expected cost: 500.000€ Sources of funding: H2020 5G VINNI and 5GINFIRE
Feasibility	High
Priority	Medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Smart City Innovation Hub; INTRACOM; https://www.5g-vinni.eu/consortium/

Activity 2.1.1: Development of smart sensors network to improve the quality of the urban environment	
Link to operational objective	OO 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment
Description	<p>The Act concerns the creation of a distributed network of smart sensors that can measure many parameters for more effective management of the Historic City Centre. In addition to interventions that require the procurement and installation of a sensor network and more generally the necessary equipment, it is planned to provide or develop a portal and mobile app as a tool for providing information services to citizens. Additionally, an administrator's platform will be developed for the operator's managers who will be able to manage the sensor network. Finally, the project requires the necessary complementary services: a) project implementation / design specification services b) training services to system administrators and c) compilation of management and use of software and interface environments.</p> <p>Through the Smart Sensor Network, we aim to: (a) Implement smart city solutions to improve urban microclimate and protect the environment. (b) Test greenhouse gas emissions and calculate the carbon footprint of the City Centre of Patras. (c) Recording and control of environmental pollution, air quality, noise pollution and light pollution by means of Internet technologies (Internet of Things-IoT) and identifying existing and predicted rates / indices. (d) Control and measurement of electromagnetic radiation in the urban fabric. (e) Improving the quality of ICT services provided via multi-channel provision. (f) Increasing accessibility to open data.</p>
Timeframe	<ul style="list-style-type: none"> • Length: 14 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 150.000 € Potential sources of funding: OP of Western Greece
Feasibility	High
Priority	High
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Municipality of Patras

Activity 2.1.2: Development of smart mobility solutions for smart parking, real-time traffic conditions and smart bus stops	
Link to operational objective	OO 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment
Description	<p>Objective: The general objective of the project is to promote smart urban mobility by implementing solutions for the collection, processing and distribution of real-time traffic data via multiple channels. The project aims at integrating distinct systems and applications for the management of infrastructure but mainly for the efficient use of useful traffic information by the citizens.</p> <p>Activities: Smart mobility solutions will be developed for the real-time information of residents and visitors of Patras about available parking places, traffic conditions and smart stops of means of public transport.</p>

Activity 2.1.2: Development of smart mobility solutions for smart parking, real-time traffic conditions and smart bus stops	
	<p>The system includes the installation of sensor networks, the development of subsystems' control software, a web-based administrator platform and a unified mobile application provided free to users. A significant key point is the development of an integrated administrator's platform for the operator's managers, which will receive data from subsystems' control software and provide online traffic data to citizens.</p> <p>Targeted beneficiaries: vehicle drivers (residents and visitors), public transport operators, municipal staff (for city traffic supervision), municipal electives (for use of the system as a decision-making tool), scientists and researchers (processing of open data)</p>
Timeframe	<ul style="list-style-type: none"> Length: 18 months Estimated beginning date of implementation: Autumn of 2019
Estimated cost and source of funding	<p>Total project budget: 950 K€.</p> <p>Source of funding: Operational Programme of Western Greece (ERDF, National Funds)</p>
Feasibility	<p>High: smart mobility solutions are mature, installation of sensor networks and administration procedures are under the responsibility of the Municipality, there is strong citizens' demand for real-time information related to available parking places and traffic conditions in the centre of Patras</p>
Priority	<p>High: there is strong citizens' demand for real-time information related to available parking places and traffic conditions specially in the centre of the city of Patras, significant improvement in the standard of living of citizens achieved through the prudent use of private cars and the exploitation of means of public transport, promotion of open data / APIs</p>
Organisation / unit in charge of delivery (i.e. ownership of the activity)	<p>Municipality of Patras (ICT Directorate, Traffic Planning Directorate)</p>

Activity 2.1.3: Gamification of EcoDriving Behaviours through intelligent Management of Dynamic car and driver information	
Link to operational objective	<p>OO 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment</p>
Description	<p>Driving style is seen not only to become a significant cause of greenhouse gas (GHG) and other air pollutant emissions but also a critical parameter regarding road safety, with huge social & financial adverse effects. GameCAR aims to develop a highly innovative and interactive Serious Games platform that will empower and guide users to adopt an eco-friendly driving style. This will be achieved, without distracting users from safe driving, through a multidisciplinary approach aiming at the development of a user friendly, unobtrusive multi-player gaming environment, where the users will not only play collaboratively/competitively using their mobile device but also using the car itself and their own bodies, thus turning eco-driving into an immersive and highly motivating experience. The sensing infrastructure of GameCAR will not only acquire data related to driving from an OBD sensor that will capture a complex set of parameters related to eco-driving but will also sense</p>

Activity 2.1.3: Gamification of EcoDriving Behaviours through intelligent Management of Dynamic car and driver information	
	environmental and physiological parameters of the driver, so as to better position the state of the system (car) in context (environment, user).
Timeframe	<ul style="list-style-type: none"> Length: 24 months Estimated date of implementation: -
Estimated cost and source of funding	Expected cost: 1.022.212 € (Total) –232.750 €(UPAT) Source of funding: European Union's Horizon 2020 research and innovation programme (grant agreement n° 732068)
Feasibility	High
Priority	Medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	1.University of Patras (Coordinator) –GREECE –Coordinator; 2.The Institute for Transport Studies (ITS) from The University of Leeds (UNIVLEEDS) –UK; 3.Brainstorm Multimedia (BRA) –SME,-SPAIN; 4.Centro Tecnológico de Automoción de Galicia (CTAG); 5.SPARK WORKS (SPARKS) SME –UK; 6.French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR) –FRANCE; 7.KITE Solutions S.l.r. SME (KITE) –Italy

Activity 2.1.4: Deployment, Operation and Management of IoT network with scalability and interconnectivity requirements with other IoT networks in the City comprising Dialog sensor platform	
Link to operational objective	OO 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment
Description	<p>Objective: To establish an IoT network and the development of related data applications to enable citizen involvement by facilitating public services and delivering high quality admin service solutions. As part of the establishment of Patras open access IoT network (https://www.thethingsnetwork.org/) which currently deploys two IoT gateways that can interconnect over 10000 sensors of various types, Dialog together with the NAM group is looking into expanding this project.</p> <p>In Patras/Greece there will be IoT coverage at locations of interest. Part of this project comprises training activities from the technology providers (Dialog Semiconductor) to all interested parties. The involved partners together with the digital ecosystem will gain significant knowhow on the design, implementation and maintenance of IoT infrastructures and but also the development of open data applications and services. The latter will be achieved through open access to this digital infrastructure.</p> <p>Activities: The project involves the deployment of a number of Dialog Semiconductor (DS) IoT Multi Sensor Boards around the city. Also 5 Development Kits from DS (Dialog Semiconductor is the technology provider that offers the sensor kit and platforms) are offered to the Smart City Innovation Hub and the University of Patras. Training activities are being carried out through the Smart City Innovation Hub.</p> <p>Targeted beneficiaries: digital ecosystem and University students</p>
Timeframe	<ul style="list-style-type: none"> Duration: 12 months Already started

Activity 2.1.4: Deployment, Operation and Management of IoT network with scalability and interconnectivity requirements with other IoT networks in the City comprising Dialog sensor platform	
Estimated cost and source of funding	The project is funded by Dialog Semiconductor as far as the hardware and training is concerned and University of Patras as far as research and development personnel is concerned.
Feasibility	High
Priority	High: To design and deliver applications and services for the citizens that will be enabled by the data, to deliver innovation through experimenting with new sensors and “things”, Develop environmentally friendly policies based on the data collected
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Smart City Innovation Hub

Activity 2.1.5: IoT sensors network to study the urban heat and pollution	
Link to operational objective	OO 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment
Description	The Atmospheric Physics Laboratory has already developed a network of temperature and humidity measuring stations to capture the urban heat island phenomenon in the city of Patras. Automatic low temperature and humidity loggers are automatically installed along the main axis of the city. The data is stored in the internal memory of each logger and is collected on-site at regular intervals by the staff and students of the Lab. In order to improve the network, it is recommended to use Online devices for Online monitoring of the measured quantities in near real time, so that it is possible to check its good functioning and to keep the audience informed.
Timeframe	<ul style="list-style-type: none"> Length: 24 months Estimated date of implementation
Estimated cost and source of funding	Expected cost: 32.600 € Sources of funding: Laboratory of Atmospheric Physics of the University of Patras (To further network development, funding is sought through project calls.)
Feasibility	High
Priority	Medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Laboratory of Atmospheric Physics of the University of Patras

Activity 2.2.1: Intelligent system for citizen activation for green urban mobility	
Link to operational objective	OO 2.2: Support actions of smart management and smart applications in public buildings and public spaces
Description	The project aims at creating an intelligent system of rewarding citizens for more efficient use of public transport in order to reduce ecological footprint in urban transport. The project's actions include: 1. Creating a "green" application in a desktop environment and smart portable devices where the user will shape their profile and travel plans. 2. Producing an Ecological Sustainable Urban Mobility model that will provide personalised mobility suggestions to the user for an ecologically optimal route, taking into account a number of factors such as: a) its profile b) the predicted traffic flow level in the selected route (c) environmental data. 3. Creating a reward system to achieve an ecological target. This award will take a variety of forms, such as discounts for shopping in municipal stores, purchase of public transport tickets, purchase of tickets for social events, in municipal parking spaces. 4. Creation of a new ecosystem of urban mobility, involving all stakeholders as well as active citizens that together make up the five-stranded parts. Ecosystem partnerships will support efficient solutions to overcome non-technical barriers and create innovative methods to meet needs.
Timeframe	<ul style="list-style-type: none"> Length: 36 months Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 1.000.000€ Potential sources of funding: State Aid Action "RESEARCH - CREATE - INNOVATE" (Operational Programme Competitiveness, Entrepreneurship and Innovation)
Feasibility	medium
Priority	Medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	University of Patras (Department of Civil Engineering)

Activity 3.1.1: ESMARTCITY – Enabling Smarter Cities in the MED Area through Networking	
Link to operational objective	OO 3.1: Exploit and expand open datasets (e.g. Geographic Information System data) as a decision-making tool available on the Internet of all GIS-enabled systems free of charge
Description	Objective: The activity intends to improve Patras innovation capacity creating/enhancing innovation ecosystems involving quadruple helix actors. In this context the activity aims to enhance local clusters, mobilise the city and proactively involve the local community leading to an overall Innovation Policy Change transferable to policy makers. Pilot testing activities in Patras involve installation of IoT and energy metering infrastructure in public buildings following the Living Lab concept and making their datasets open under licence to interested stakeholders. Activities: During the project pilot testing phase utilisation of digital and energy saving technologies in public buildings will be sought, promoting open data / APIs scheme. The project will intervene in a number of public buildings (e.g. Industrial Systems Institute premises, Region of Western Greece buildings, schools in the area of Patras)

Activity 3.1.1: ESMARTCITY – Enabling Smarter Cities in the MED Area through Networking	
	<p>creating energy efficiency and IoT infrastructure. Open datasets will be promoted and capacity building activities towards local SMEs and clusters will be performed. The lessons learnt will lead to a Green Paper on Innovation Policy Change that will be transferred towards local authorities.</p> <p>Targeted beneficiaries: Local SMEs and innovative clusters, public sector and policy makers, academia and research, general public.</p>
Timeframe	<ul style="list-style-type: none"> Length: 30 months Estimated date of implementation: Ongoing since February 2018
Estimated cost and source of funding	Total project budget 2,5 M€ of which 565 K€ are related to the pilot testing and transferring in Patras. Source of funding ERDF under Interreg MED programme
Feasibility	High: technologies are mature, there is user demand for solutions related to energy savings and efficiency in the building sector, in line with other local stakeholder initiatives such as Energy Consumption Observatory
Priority	High: promoting an innovation policy change towards open data / APIs and integrating the different pilots implemented by different stakeholders in the city can significantly enhance city innovation ecosystem allowing new services over the deployed infrastructure and ascertaining its lifecycle considerations
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Industrial Systems Institute and Region of Western Greece

Activity3.2.1: Dynamic citizen identification of the city's smart electronic services with no need for human intervention	
Link to operational objective	OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added.
Description	<p>The use of services in every smart city requires full interoperability of services with authentication and citizen identification providers securely. The use of electronic means of authentication and identification is also emerging especially as it is adopted by younger citizens - service providers. The organisation of security identification is the only reliable way of safeguarding privacy and personal data protection. The identification process is a deterrent to the widespread adoption of high- value added services, high-cost services and mass-market services. For value-added services often cost coverage is required and identification of the citizen in order to safeguard the environment of the service or the means that add value. High-cost services include risk that is addressed by organised user registration in order to ensure the integrity of the services. For the services in particular for tourism and culture activities where there is massive use such as visiting groups of tourists at short intervals and identification is necessary and redeemable in each and every place again and again resulting in significant delays and a decrease in the rate / daily visitors. It is therefore recommended to use international standards such as ISO18013-5 with which use of mobile devices is possible with assurance but without delays and waiting for citizens. In this way businesses will be able to provide services to both its citizens and visitors by doing them safely but with</p>

Activity3.2.1: Dynamic citizen identification of the city's smart electronic services with no need for human intervention	
	speed and protection of privacy. This process enhances the possibility of using open data for citizens to create new services.
Timeframe	<ul style="list-style-type: none"> Length: 60 months Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 4.000.000€ Potential sources of funding: NSRF, Horizon, Regional Operational Program (ROP), Public - Private Partnerships (PPPs), private initiative
Feasibility	low
Priority	medium
Organisation / unit in charge of delivery	University of Patras (Department of Computer Engineering & Informatics) Hellenic Open University

Activity 3.2.2: Virtual Desktop Interface: a virtual desktop pilot service	
Link to operational objective	OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added
Description	The VirtualDesktopInterface-VDI infrastructure provides a personalised desktop that the user (student or teacher in the case of Education) can access from any workstation with an Internet connection. In fact, the desktop (virtual machine) is run on cloud computing infrastructures, and via the Internet is available in a variety of points and workstations. For schools, VDI technology will ensure the easy creation and operation of workshops tailored to the needs of the courses and will offer quality access to e-learning and governance services and digital educational content. At the same time, it will drastically reduce the cost of maintaining ICT infrastructure in schools, because workstations can use cheap terminals. The VDI solution can be applied directly to the Optical Fibre Metropolitan Network of the Municipality of Patras, which interconnects public sector bodies (e.g. schools, hospitals, etc.) to ultra-high speeds (100 Mbps to 1 Gbps). The results of the VDI Pilot Infrastructure will be exploited to scale it to more school-based units interconnected with the Metropolitan Fibre Optic Networks of Municipalities across the country.
Timeframe	<ul style="list-style-type: none"> Length: 36 months Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 620.000 € Potential sources of funding: NSRF/ROP of Western Greece
Feasibility	medium
Priority	Low
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Computer Technology Institute & Press Diophantus (Directorate of Pan-Hellenic School Network and Network Technologies), the Chamber of Commerce of Achaia or another representative of companies

Activity 3.2.4: Orange Grove Patras- Patras Science Park	
Link to operational objective	OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added
Description	Orange Grove Patras is a flexible workspace and incubator for young entrepreneurs aspiring to become a catalyst for the development and growth of the local start-up ecosystem in the area of Western Greece. At OG Patras young entrepreneurs will find assistance, cooperation, mentoring and inspiration to form innovative and successful start-ups, capitalising on the unexploited opportunities of this area and beyond (human capital, geographic location, infrastructures). Other than a business incubator and mentoring program, Orange Grove offers training and educational programs and the opportunity for the participants to participate in numerous networking events.
Timeframe	<ul style="list-style-type: none"> • Length: - months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: - Potential sources of funding: -
Feasibility	High
Priority	High
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Patras Science Park

Activity 4.1.1: Smart ICT applications to promote thematic tourism	
Link to operational objective	OO 4.1: Support ICT applications related to thematic tourism
Description	The project concerns the promotion of thematic tourism through ICT applications at the Historic Centre of Patras. The Act will provide effective navigation of visitors and citizens by providing tourist and cultural information, exploiting services that exploit spatial data, while also providing the opportunity to present information about Patras points of interest using QR tag technology. This Patras Promotion Action as a Tourist Destination and Visitor Interaction aims to develop digital interactive and multi-channel services to visitors, aiming at promoting and promoting tourism and culture in the area (focusing on theme groups - tourism) and at the same time the promotion and support of local enterprises of culinary and cultural interest (traditional workshops, wineries, cheese makers etc.), as well as the promotion of local produced products. The Action includes two main platforms: a) Patras promotional platform as a tourist destination and visitor interaction b) Loyalty and reward platform.
Timeframe	<ul style="list-style-type: none"> • Length: 8 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 200.000 € Potential sources of funding: OP of Western Greece

Activity 4.1.1: Smart ICT applications to promote thematic tourism	
Feasibility	High
Priority	High
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Municipality of Patras

Activity 4.1.2: Intelligent Tourism Entrepreneurship Support System through the creation of a cluster and specialisation centre for underwater tourism	
Link to operational objective	OO 4.1 - Support ICT applications related to thematic tourism
Description	<p>The proposal aims at making full use of the assets of the natural and cultural heritage of the seabed in the city of Patras, promoting a viable and responsible way of mapping, valuing and protecting this wealth. This will provide significant added value to new tourism products and services in the city and will increase competitiveness, economy and quality of life. The proposal, through the use of special blue technologies, supports the creation of a cluster and a specialisation centre to increase the value of tourism services in the city. This will be achieved by overcoming non-technical barriers and the active involvement of stakeholders. The project will benefit directly the tourism sector through the protection and exploration of underwater natural and cultural heritage and the development of value-added services. Innovative tools and solutions such as underwater ROVs, AUVs, technologies offering 3 dry diving experiments etc will be used. New skills will be developed and cultivated by submarine archaeologists, biologists, geologists, oceanographers, leading to more opportunities for the scientific diving community. The results of the actions will be offered to the underwater and marine community in cooperation with strong participation of SMEs. The new underwater tourism ecosystem will involve all stakeholders as well as active citizens who together are the parts of the five-stranded propeller.</p>
Timeframe	<ul style="list-style-type: none"> • Length: 36 months • Estimated date of implementation: -
Estimated cost and source of funding	<p>Estimated cost: 1.000.000€ Potential sources of funding: ADRION Program</p>
Feasibility	High
Priority	medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	University of Patras (Department of Civil Engineering)

Appendix Ib: Activities for potential future adaptation

PFA⁵ 1: Smart Road Surface as a Communication Platform for Autonomous and Interconnected Vehicles (CAVs)	
Link to operational objective	OO 2.2: Support actions of smart management and smart applications in public buildings and public spaces
Description	The development of linked and automotive vehicles (CAVs) brings important challenges and opportunities to the operation and management of urban motorways in cities that are trying to focus on innovation such as the city of Patras. Key role for the development of coupled and automotive vehicles is the existence of smart pavements that allow for real-time hardware/ software interconnection between vehicle-centre control signals. This activity includes: 1. Testing (on a Laboratory Scale) of the Properties of Bituminous Concrete with a main focus on their incorporation in the Current Technical Specifications and the Transmission Capacity 2. Development of a conventional vehicle in order to have the characteristics of the stand-alone vehicle 3. Development of the software for the road-vehicle-traffic light-traffic-control centre-on-board cooperation 4. Development of hardware for the support of CAVs 5. Development of special adjustments in GIS software for determining the exact location of the vehicles 6. Plaster construction 7. Operation-Monitoring-Correction of errors
Timeframe	<ul style="list-style-type: none"> Length: 24 months Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 700.000€ Potential sources of funding: European Research Program
Feasibility	low
Priority	medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	1. Municipality of Patras 2. Company for the supply of specialised additives for the modification of asphalt 3. Engineering and Transportation Institute 4. Private company for software and apps development 5. Private company of GIS computing tools development 6. Private Hardware development company (for IOT) 7. Pavement Construction Company «AXONAS ATEVE»

⁵ PFA: Potential Future Activity

PFA 2: Businesses Networking Platform	
Link to operational objective	OO 1.1: Create pilot projects for businesses, including pilot networks of open digital infrastructures and services supporting research, innovation and entrepreneurship
Description	The proposal concerns the creation of a networking platform for businesses in our region that will support interconnection with Public Administration and Development Policy Designers, Chambers, the Academic-Research Community and the productive organisations. The interconnection of small businesses / SMEs in the region with the professionals and the use of innovative tools and methods (crowdsourcing, tele-education, teleconferencing, data exchange, etc.) creates a dynamic in the business profile of our region, enhancing its competitiveness and extroversion area.
Timeframe	<ul style="list-style-type: none"> • Length: 36 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 500.000 € Potential sources of funding: European Research Program, ROP of Western Greece, Public Investments Program etc.
Feasibility	medium
Priority	medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Region of Western Greece, Municipality of Patras, Chambers of Western Greece, Research Organisations and Entrepreneurship Support Bodies

PFA 3: Operation and Management of open 5G technology to support primary sector (agricultural crops, fish farming and manufacturing)	
Link to operational objective	OO 1.1: Create pilot projects for businesses, including pilot networks of open digital infrastructures and services supporting research, innovation and entrepreneurship
Description	In this activity many partners are involved and the use cases that will be delivered are related to the following: different precise agriculture systems based on 5G technologies for smart irrigation, smart greenhouse, drone monitoring and remote machinery maintenance. Specifically, for the precision spraying, a smart agriculture environment based on autonomous machinery is an adequate use case to evaluate this service. The applicability of these technologies will be verified and tested in the agriculture facilities in Patras. For the Smart feeding scenarios in Aquaculture, several devices will be adapted to 5G (NB-IOT) and deploy at various fish farms to monitor the water quality parameters, and also provide weather information. Specific VNFs will be developed to get information from the device for a specific measure. Algorithms will be developed to provide new services to fish farmers which vary across the different locations. Furthermore, for the surveillance of the aquaculture, several devices will be adapted to 5G (NB-IOT) and deploy at various fish farms to monitor the water quality

PFA 3: Operation and Management of open 5G technology to support primary sector (agricultural crops, fish farming and manufacturing)	
	parameters, and also provide weather information. The activity will showcase the direct benefits of ICT in the primary sector Innovation capacity is enhanced Innovation and digital skills are enhanced. Digitisation of services may expand in other sectors.
Timeframe	<ul style="list-style-type: none"> Length: 36 months Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 500.000€ Potential sources of funding: H2020 ICT 19
Feasibility	medium
Priority	Low (for the City, may be important for rural areas)
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Intracom Smart City Innovation Hub

PFA 4: Operation and Management of open 5G technology to support PPDR (Public Protection and Disaster Relief)	
Link to operational objective	OO 2.2: Support actions of smart management and smart applications in public buildings and public spaces
Description	In this specific activity, we will investigate how the 5G network will addresses the support of communication in firefighting scenarios for both urban and rural/wild fire environments, addressing both prevention and response measures. Recent examples matching the two scenarios include this year's Attica's fires and two years ago in the Peloponnese area respectively. We identified these two environments as relevant targets in which to evaluate the 5G technology as a mean to improve event identification, operation and disaster relief by PPDR entities. The scenario will essentially be run through the testbed located in University of Patra's. To support preventive and reactive types of measures various sensors will be deployed on both rural and urban environments. These sensors will provide information such as temperature readings, video images, air quality or wind speeds to serve as input to analytic algorithms. More concretely, the deployment of the following use case will be targeted: Urban fire: 5G-VINNI (University of Patras) extended with a remote base station to a park (about 6 km of distance), surrounded by densely populated neighbourhoods and a significant number of houses.
Timeframe	<ul style="list-style-type: none"> Length: 36months Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 500.000€ Potential sources of funding: Horizon 2020
Feasibility	low

PFA 4: Operation and Management of open 5G technology to support PPDR (Public Protection and Disaster Relief)	
Priority	high
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Smart City Innovation Hub

PFA 5: Platform Expansion and Management for administrating citizens' requests and problems in the city (sense city)	
Link to operational objective	OO 3.1: Exploit and expand open datasets (e.g. Geographic Information System data) as a decision-making tool available on the Internet of all GIS-enabled systems free of charge
Description	<p>The Sense.City platform is a citizen-sourcing platform used by citizens to improve their city and to enable the communication between them and the city's public services. The Sense.City platform offers a mobile application as well as backend services to facilitate the issue management by the city's public services. What makes Sense.City unique is that its services and mobile application are transferable and can be used by any city in the world. It presents city data analytics and is provided as open source, so cities can either integrate it with their own services or use free of charge a web cloud-hosted solution and Sense.City open data API. Currently Sense.City is fully operational in three cities (Patras, Zakynthos, Pyrgos) and is in pilot stage in others. The Sense.City platform which is developed, supported and offered for free as a service the last two years from the University of Patras, consists of: a mobile application, a public city dashboard and a backoffice issue management service. Citizens can use the Sense.City platform to report city issues or participate in related issues, letting city public authorities know about defects and damages of city infrastructures, such as broken traffic lights, streetlamps or parking meters as well as garbage or abandoned vehicles. This is enabled by the integration of a rich set of capabilities like GPS, accelerometer, camera, microphone included today in every mobile device. The platform consists of a mobile application as well as a web application. It offers an open API that can be embedded to other applications.</p>
Timeframe	<ul style="list-style-type: none"> • Length: - months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: - Potential sources of funding: -
Feasibility	High
Priority	High
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Smart City Innovation Hub

PFA 6: Developing a network of smart sensors and IoT technologies on the Patras marine front aiming of improving the quality of life of the citizens and enhancing the interaction with visitor / passenger flows travelling by the sea	
Link to operational objective	OO 2.1: Create and exploit a network of smart sensors and IoT technologies to improve the urban environment
Description	It is proposed to install wireless sensors for measuring water quality parameters, as well as noise measurement sensors, especially in high-traffic or pleasure-boating locations, with the aim of creating a real-time data collection grid conditions in its coastal environment town. In addition, the above infrastructure is proposed to be complemented by recorders of the movement of recreational boats, vehicles in the area of the sea front as well as of passengers traveling by sea to and from the berth areas so that there is a complete real-time depiction of the situation in the sea area of the city. The proposed proposal is broken down into four main activities: 1. Application design, specifying the specific conditions for the installation of equipment and telecommunication interfaces 2. Installation of sensor network and accompanying equipment 3. Development of surveillance and information applications based on the network of sensors and devices installed in the sea zone 4. Pilot application, system operation checks.
Timeframe	<ul style="list-style-type: none"> • Length: 18 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 1.000.000€-1.500.000€ Potential sources of funding: ROP of Western Greece, Territorial Cooperation Programmes, EASME Blue Economy Call, H2020 Blue Growth & Smart Cities Calls
Feasibility	low
Priority	Medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Region of Western Greece, Municipality of Patras, Patras Port Authority

PFA 7: Smart School Networks for connecting research and school education (earthquakes, radio spectrum)	
Link to operational objective	OO 2.2: Support actions of smart management and smart applications in public buildings and public spaces
Description	The proposed project aims at creating a network of schools in the territory and utilising the existing school infrastructures for the transmission of data. The data collected by the school units on the sensor network will concern measurements (meteorological, seismic, dynamic behaviour of buildings, radio spectrum) will be sent to a central system where they will be processed by competent research teams. Researchers will obtain data and will compensate educative packages

PFA 7: Smart School Networks for connecting research and school education (earthquakes, radio spectrum)	
	for dissemination to students' concepts such as science / research, civil protection, climate change, biodiversity etc. The following actions will be implemented within the framework of the proposed action: Market research to find appropriate sensors in terms of cost and quality for network; Implementation and procurement; Installation of sensors in school units and their interconnection with GDS; Create a centralised data delivery system.
Timeframe	<ul style="list-style-type: none"> • Length: 24 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 250.000 € Potential sources of funding: -
Feasibility	medium
Priority	low
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Computer Technology Institute & Press Diophantus; Scientific body (e.g. University / University of Applied Sciences / Institute) associated with the processing of the data produced by sensors; Companies that are active in the field of sensors and / or the Internet of Things (IoT) and want to show through the project their products

PFA 8: Patras Open Mall	
Link to operational objective	OO 3.1: Exploit and expand open datasets (e.g. Geographic Information System data) as a decision-making tool available on the Internet of all GIS-enabled systems free of charge
Description	<p>The aim of the Patras Open Mall is to promote Patras as an open, functional market for European awareness and reach, with cultural, environmental and social added value for residents, workers and visitors. In the context of the role of the Municipality of Patras and the Commercial and Importing Association, the proposed act supports a strategy to promote those comparative advantages of the city and prospects - opportunities for their emergence that will give the intervention area the opportunity to become a major urban commercial Centre and Pole of Consumption.</p> <p>City Municipality Actions: Public Area Upgrade, Supply and Installation of Smart City Systems, Supply and Installation of Sustainable Urban Mobility Systems</p> <p>Patras Commercial & Enterprising Association actions: Functional / aesthetic upgrading of the relationship of the benefiting enterprises with the public space in the intervention area.</p>
Timeframe	<ul style="list-style-type: none"> • Length: 36 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 1.823.632,82 € Potential sources of funding: Operational Programme Competitiveness, Entrepreneurship and Innovation

Feasibility	high
Priority	medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Municipality of Patras, Patras Commercial & Enterprising Association

PFA 9: e-Governance and simplification of processes for the communication between schools and municipality	
Link to operational objective	OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added
Description	The proposed activity aims to simplify the processes and workflows that exist between Schools and Municipalities. To this end, existing infrastructures and investments of the Greek Ministry of Education, Research and Religious Affairs will be exploited, as well as the high degree of digital readiness of schools. The system that will be produced will help to reduce the operating costs of schools' maintenance, by better monitoring the level of service provided by municipalities in schools across the country. Within the framework of the action, after a relevant study and analysis of the technical requirements, an integrated web-based information system will be developed which will complete and offer the following electronic services (indicatively): 1. Granting a grant from the relevant Municipality to the School Committees and vice versa 2. Monitoring of school running costs in real time, with school invoices for maintenance and technical support services received from private individuals 3. Monitoring (in real time) of the remaining grant per school 4. Submission by schools of requests for service maintenance by the municipality (technical service) 5. Performance monitoring of the implementation of school requests 6. Production of statistical reports 7. Evaluation by schools of received maintenance services 8. Registration of the building status and historical data of the school units by technical departments of the Municipalities 9. Registration by municipal technical bodies of the building status of the school buildings and gradual creation of a digital school registration. This registry will be able to interoperate with <i>myschool</i> building register and other national building registers.
Timeframe	<ul style="list-style-type: none"> • Length: 36 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 400.000 € Potential sources of funding: NSRF/ROP of Western Greece, NSRF/OP Public Sector Reform
Feasibility	medium
Priority	Low
Organisation / unit in charge of delivery	Computer Technology Institute & Press Diophantus (Directorate of Pan-Hellenic School Network and Network Technologies), Municipality of Patras or municipal authority

PFA 9: e-Governance and simplification of processes for the communication between schools and municipality	
(i.e. ownership of the activity)	

PFA 10: Build and expand internal school networks with new service: “Bring your own Device”	
Link to operational objective	OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added
Description	The proposed project aims to provide high level access for teachers and pupils to digital educational content and digital services (e-learning and e-government) provided by the <i>Ministry of Education, Research and Religious Affairs</i> to schools. This access will be possible either through ICT infrastructure of schools or through personal mobile devices of users. In order to access the digital services and educational content developed by the Ministry and its actors for school education, appropriate mobile applications should be developed for all the popular platforms available (Android, Mac etc.). Since the bandwidth of Internet access circuits is a key factor in the quality of the BYOD-BringYourOwnDevice service, it is suggested that the BYOD service is initially implemented in schools connected to Metropolitan Optic Fibre Networks of Patras (i.e. about 80 schools), as they already have ultra-high speed optical access. To this end: Internal networks (wired and wireless) will be built in the primary and secondary schools and administrative units and their network equipment will be upgraded in order to have high-speed Internet access, and the service will be developed and offered BYOD to the Pan-Hellenic School Network.
Timeframe	<ul style="list-style-type: none"> Length: 24 months Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 350.000 € Potential sources of funding: NSRF/ROP of Western Greece
Feasibility	high
Priority	low
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Computer Technology Institute & Press Diophantus (Directorate of Pan-Hellenic School Network and Network Technologies), Municipality of Patras or municipal authority

PFA 11: Infrastructure for Fast Content Delivery Network	
Link to operational objective	OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate

PFA 11: Infrastructure for Fast Content Delivery Network	
	students and young entrepreneurs on the use and needs in order to add value added
Description	The project concerns the development of an infrastructure for the rapid distribution of educational content in (about 130-150) schools of the Municipality of Patras, which maintains the local copies of the educational content of the central systems of the Ministry of Education. The service will take care, either on demand or scheduling, according to the content requested by users, to synchronise the content of local servers with server resources, in non-functioning schools (evenings, weekends, public holidays), thus reducing the burden network at peak hours (school opening hours). The FastContentDelivery Network infrastructure is implemented by a cluster of source servers (origin server) and by one or more replica / cache servers' levels that contain the copies of the educational content. The principle of operation is based on the process of downloading and caching at an earlier time of digital content on the secondary servers. Secondary servers request server resources, content that has been requested by users and not stored. The process is repeated until the object requested or the request arrives at the source. In this way, a delay is only observed the first time an object is requested. Finally, in any case delivery to the user is done directly by the local sub-server. For schools that lack the appropriate equipment, a local server will be required with an estimated unit cost of € 1,000.
Timeframe	<ul style="list-style-type: none"> • Length: 24 months • Estimated date of implementation: -
Estimated cost and source of funding	Estimated cost: 200.000 € Potential sources of funding: NSRF/ROP of Western Greece, NextGenerationAccess Program (OP Competitiveness, Entrepreneurship and Innovation)
Feasibility	medium
Priority	medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Computer Technology Institute & Press Diophantus (Directorate of Pan-Hellenic School Network and Network Technologies)

PFA 12: Parental awareness raising on secure and creative Internet	
Link to operational objective	OO 3.2: Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added
Description	The project aims to educate and educate parents about the correct, safe and creative use of Internet services. Although the Greek School Network applies policies and techniques that ensure as much as possible safe access to its services and the Internet in general, the need to raise awareness, information and educate parents remains

PFA 12: Parental awareness raising on secure and creative Internet	
	<p>particularly important and necessary. This is because a large number of students on a daily basis access the Internet through uncontrolled environments, such as student homes.</p> <p>The following actions will be implemented within the framework of the proposed action: a) Conducting experiential seminars and actions in schools of the Municipality of Patras on the safe use of the Internet. b) Implementing a parent support node in safe Internet surfing c) Quality control and quality label delivery in schools (parents' and guardian associations) that have and implement a Safer Internet Navigation. d) Promotional activities will take place within this framework actions and publicity actions.</p>
Timeframe	<ul style="list-style-type: none"> • Length: 24 months • Estimated date of implementation: -
Estimated cost and source of funding	<p>Estimated cost: 150.000 €</p> <p>Potential sources of funding: Erasmus Plus</p>
Feasibility	medium
Priority	medium
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Computer Technology Institute & Press Diophantus (Directorate of Pan-Hellenic School Network and Network Technologies)

PFA 13: Smart tourism platform focusing on cultural and creative industries	
Link to operational objective	OO 4.1: Support ICT applications related to thematic tourism
Description	<p>The proposal concerns the creation of an intelligent system for the promotion and promotion of the cultural and cultural heritage of the city of Patras. A system that will capture the cultural and creative industry of the city and will emphasise the use of art in the public space (street art). In this context, a smart platform to promote, promote, and navigate the city based on public art points of interest will involve the visitor and the local community in an integrated process of proclaiming the city as an open museum - a venue for events and events. Also, the platform on the city tour will connect the visitor with the local products of the region and local entrepreneurship. Different tourist packages can be designed based on an integrated, intelligent tourist promotion / viewing and touring system in the city of Patras.</p>
Timeframe	<ul style="list-style-type: none"> • Length: 36 months • Estimated date of implementation: -
Estimated cost and source of funding	<p>Estimated cost: 700.000 €</p> <p>Potential sources of funding: ROP of Western Greece, European Programs, Public Investments Program</p>
Feasibility	low

PFA 13: Smart tourism platform focusing on cultural and creative industries	
Priority	high
Organisation / unit in charge of delivery (i.e. ownership of the activity)	Municipality of Patras, Chamber of Achaia, Cultural institutions, Tourism agencies

Appendix II: Performance assessment framework

At this stage the aggregation from Activities to Operational Objectives and from there to Ambitions has been conservative: it reflects aggregate indicators of selected activities only. Indicators for Operational Objectives and Ambitions will be adapted/increased as new activities will be designed in the 10-year horizon of the DCC strategy. Outcomes may double or even triple if sufficient financial resources are offered over the next programming period.

1. Strategy outcomes

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Ambition statement 1	To exploit and strengthen broadband infrastructures, new generation networks and computing capabilities	Monitoring indicator 1.1: Number of start-ups using advanced infrastructure	No data available; data to be collected in 2021 from the Registry of the Chamber	Create 5 new operational companies per year	50 companies in 10 years	Annual data from the Registry of the Chamber complemented with data on companies benefitting from public support
Ambition statement 2	To enhance sustainable urban development in Patras through the implementation of large-scale cutting-edge technologies	Monitoring indicator 2.1: Contribution to the Circular Economy	Questionnaire on the platform	Percentage reduction in CO ₂ , NO _x , PM _{2.5} emissions: 20%	5 years	Data collected from the measurements of the installed sensors by the Municipality of Patras
Ambition statement 3	To provide digital infrastructure, services and content to citizens and businesses quickly, easily, everywhere	Monitoring indicator 3.1: Number of companies using open data and open digital infrastructure	No data available; survey in 2021 (current estimate 5-6)	20 profitable local companies	5 years	Survey

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Ambition statement 4	To adopt ICT solutions for making Patras a pole for citizens' culture, visitors' attraction and tourists' destination	Monitoring indicator 4.1: Downloads/Use of local-tourism/culture apps	Unknown, identification of apps and data on unique clicks	2000 annually	5 years	Data on unique clicks

2. Strategy intermediate outcomes

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational objective 1.1	Create pilot projects for businesses, including pilot networks of open digital infrastructures and services supporting research, innovation and entrepreneurship	Monitoring indicator 1.1.1: Number of start-ups using advanced infrastructure or open data	Data from Region of Western Greece in the process of being collected in the context of the EER project	50 new companies	10 years	Steering Committee and Municipality surveys
Operational objective 2.1	Create and exploit a network of smart sensors and IoT technologies to improve the urban environment	Monitoring indicator 2.1.1: Number of IoT devices (including sensors) available for data collection contributing to open data sets	100	2000	5 years	Data captured from DCC Steering Committee Platform
Operational objective 2.2	Support actions of smart management and smart applications in public buildings and public spaces	Monitoring indicator 2.2.1: 2.2.1. Number of people utilising the urban mobility green application	0	2% of the population	10 years	Data captured from DCC Steering Committee Platform

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

	Expected result	Monitoring indicator	Baseline	Target	Timeframe	Means of verification
Operational objective 3.1	Exploit and expand open datasets (e.g. Geographic Information System data) as a decision-making tool available on the Internet of all GIS-enabled systems free of charge	Monitoring indicators 3.1.1: Number of companies using open data and open digital infrastructure	0	20 profitable local companies	5 years	Data captured from DCC Steering Committee Platform
Operational objective 3.2	Promote the development of digital culture in state-of-the-art technologies (e.g. cloud computing, high volume data) and educate students and young entrepreneurs on the use and needs in order to add value added	Monitoring indicator 3.2.1: Number of people trained in state-of-the-art technologies	Unknown	500	5 years	Survey to be conducted by the Steering Committee
Operational Objective 4.1	Support ICT applications related to thematic tourism	Monitoring indicator 4.1.1: Number of new apps for thematic tourism in Patras	0	10	5 years	Data on projects supported from the Region of Western Greece and Municipality
		Monitoring indicator 4.1.2: Downloads and Use (unique clicks) of new apps for thematic tourism in Patras	0	Gradual increase to reach over 500 people annually (mostly linked to carnival)	5 years	Data on unique clicks monitored by the DCC Smart City Platform

3. Strategy outputs

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
Activity 1.1.1	Installation, Operation, Management and Future Expansion of 5G Networking Infrastructure with Open-Source Technologies and Open Access	Monitoring indicator 1.1.1.1 Number of Outdoor Base stations	5 vertical outdoor base stations	5 years	Data captured from DCC Steering Committee Platform
Activity 2.1.1	Development of smart sensors network to improve the quality of the urban environment	Monitoring indicator 2.1.1.1 Number of IoT devices (including sensors) available for data collection contributing to open data sets	2000	5 years	Data collected from the DCC Steering Committee Platform
		Monitoring indicator 2.1.1.2 Number of open data types provided	4 open datasets (air pollution, noise level, luminosity level, electromagnetic radiation)	5 years	Open datasets derived from the data processing of sensors by the Municipality of Patras
Activity 2.1.2	Development of smart mobility solutions for smart parking, real-time traffic conditions and smart bus stops	Monitoring indicator 2.1.2.1 Points collecting traffic/parking data	28 devices for traffic tracking, 836 parking sensors, 5 nodes measuring the free parking places in municipal spaces, 24 smart bus stops	5 years	Data collected from the measurements of the installed sensors, nodes and devices by the Municipality of Patras
		Monitoring indicator 2.1.2.2 Number of open data types provided	4 open datasets (traffic conditions, road parking, use of municipal parking)	5 years	Open datasets derived from the data processing of sensors, nodes and devices

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
			places, use public transport)		by the Municipality of Patras
Activity 2.1.3	Gamification of EcoDriving Behaviours through intelligent Management of Dynamic car and driver information	Monitoring indicator 2.1.3.1 Number of users/drivers utilising the Eco driving gamification platform	More than 1000 user in Patras (more than 0,5% of population)	10 years	Survey; DCC Steering Committee; Data automatically generated by the application (Driving behaviour data extracted from the OBD sensor) and stored to the GameCAR Database at UPATRAS
Activity 2.1.4	Deployment, Operation and Management of IoT network with scalability and interconnectivity requirements with other IoT networks in the city comprising Dialog sensor platform	Monitoring indicator 2.1.4.1: Number of Open data pilots and projects	20 pilots and projects	10 years	Data captured from DCC Steering Committee Platform
Activity 2.1.5	IoT sensors network to study the urban heat and pollution	Monitoring indicator 2.1.5.1 Number of open data types provided	2 open datasets (temperature, humidity)	10 years	Open datasets derived from the data processing of measuring stations
Activity 2.2.1	Intelligent system for citizen activation for green urban mobility	Monitoring indicator 2.2.1 Number of IoT devices (including sensors) available for data collection contributing to open data sets PM more output should have usage	10	10 years	Downloads

DIGITAL CITIES CHALLENGE – Digital Transformation Strategy

	Expected result	Monitoring indicator	Target	Timeframe	Means of verification
		instead as outcome of OO			
Activity 3.1.1	ESMARTCITY – Enabling Smarter Cities in the MED Area through Networking	Monitoring indicator 3.1.1.1 Number of new networks targeting company collaboration	40 networks	5 years	Survey
Activity 3.2.1	Dynamic citizen identification of the city's smart electronic services with no need for human intervention	Monitoring indicator 3.2.1.1 Number of people trained	50 people	5 years	DCC Steering Committee Survey
Activity 3.2.2	Virtual Desktop Interface: a virtual desktop pilot service	Monitoring indicator 3.2.2.1 Number of people trained	400	5 years	DCC Steering Committee Survey
Activity 3.2.3	PoC Proof of Concept program- Patras Science Park	3.2.3.1 Number of people trained	50 people	5 years	Monitoring by Smart City Innovation Hub
Activity 3.2.4	Orange Grove Patras- Patras Science Park	3.2.4.1 Number of companies funded	5 companies	5 years	Monitoring by Smart City Innovation Hub
Activity 4.1.1	Smart ICT applications to promote thematic tourism	Monitoring indicator 4.1.1.1 Number of applications created	5 applications	5 years	Data of projects supported from the Region of Western Greece and Municipality
Activity 4.1.2	Intelligent Tourism Entrepreneurship Support System through the creation of a cluster and specialisation centre for underwater tourism	Monitoring indicator 4.1.2.1 Number of applications mapping land and water resources	2 applications	5 years	University of Patras

Appendix III: Relevant Good practices

Community

The **Smart Cities Innovation Hub**, based in Patras Science Park, is an initiative of the Network Architectures and Management Group together with the Patras Science Park. It is active in the development, production and exploitation of smart cities products and solutions. Its conception (in alignment with other innovation hubs) is an initiative of Patras Science Park, aiming at strengthening research, technological development, innovative ideas and cooperation with business partners. The Hub promotes digitisation through open digital infrastructure projects and pilots for citizens, enterprisers and researchers. It has developed into an ecosystem supported by a blend of highly innovative SMEs and research labs active in the fields of IoT, cloud and related testbeds. The Hub together with the Municipality of Patras have developed and are currently in charge of implementing the part of the Strategic Smart City Plan related to the Digital Infrastructures.

Part of the overall ambition of the City of Patras and Smart City Innovation Hub is to create an open 5G-based smart city digital infrastructure that will enable the formation of a research and innovation ecosystem taking advantage of the highly competent class of people in the area (scientists, entrepreneurs, start-ups, public administrators, students, citizens etc), eager to keep up with the new international challenges of the digital society. This will be achieved in close collaboration with academic/research organisations, the city/region authorities, and industrially driven innovation hubs or other public agencies and will be adopted outcomes from international initiatives and open source/hardware projects of a number of individual network technologies with NFV, SDN, MEC, 5G and IoT being the major ones.

The ambition of the Hub is to assist in the City digitisation through dissemination, awareness building and consulting activities (like Hackathons etc.) but also via offering an Open Laboratory Ecosystem, which will be governed by the Hub. Part of the open digital infrastructure is the city platform, a critical architecture element of the Open Laboratory Ecosystem for a) operational stability and b) maximising the potential of the city and the regions stakeholders. Currently an IoT core network infrastructure is being deployed to reach 10 IoT LoRa Gateways. The Hub has already deployed 3 of them across the city covering large areas of the city. In the next few months the rest of them are going to be set up in order to provide

full city coverage. This IoT infrastructure will be used to support third party IoT scenarios using an IoT platform contributed by one of the local companies which specialises in IoT. Specific use cases are considered that pertain to environmental issues.

<https://www.psp.org.gr/en/content/smart-cities-innovation-hub>

<https://www.facebook.com/PSP-Innovation-HUBs-1696202783728690>

Open data

The Municipality of Patras has developed a system of information and services management that exploits the Geographical Information System Database of the Municipality and provides open data to the citizens and all interested parties. The main areas of geographic data development are:

- Urban Planning
- Waste Management
- Public lighting
- Parking

Through a GIS system, a common and unified access point of information for citizens is provided in an organised and fully updated system of GIS data and applications. The development of the Geographic Information Database includes the digitisation of spatial data, the formation of metadata in a database and the development of specific applications accompanied by digital GIS data.

The Municipality of Patras has developed a platform through which it provides geographical information. More specifically it has developed:

Urban Planning

These data may refer to administrative boundaries, building factors, building block number and information about which areas are included in the city planning.

Waste Management

Through the application, the location of the waste and recycle bins is indicated as well as the routes of the waste trucks for the collection of bins. A study is being undertaken on how to optimise the routes.

Public Lighting

It depicts the municipality lighting in the historical centre of the city as well as the points that control the specific lighting. Information on the kind of luminaire, the type of lamp and its location is available.

Parking

In the context of the operation of the controlled parking, a municipal information system has been developed which informs about the limits of the controlled parking and the points of sale of the parking cards.

The results are daily updated.

https://gissrvweb.geopatras.gr/publish_t/webapps/dp/

Support services

The **Sense.City** platform is a citizen-sourcing platform used by citizens to improve their city and to enable the communication between them and the city's public services. The Sense.City platform which is developed, supported and offered for free as a service the last two years from the University of Patras, consists of:

- A mobile application;
- A public city dashboard and;
- A backoffice issue management service

Citizens can use the Sense.City platform to report city issues or participate in related issues, letting city public authorities know about defects and damages of city infrastructures, such as broken traffic lights, streetlamps or parking meters as well as garbage or abandoned vehicles. Users choose an issue category, type in the address (or switch on the automatic geo-location service), optionally take a photo and submit their request. What makes the Sense.City platform unique is that its services and mobile application are transferable and can be used by any city in the world. It presents city data analytics and is provided as open source, so cities can either integrate it with their own services or use free of charge a web cloud-hosted solution and Sense.City open data API.

Currently Sense.City is fully operational in three cities (Patras, Zakynthos, Pyrgos) and is in pilot stage in others.

Having **citizens being a source – a “city sensor”**– within a smart city, the traditional scenario of having citizens as consumers of government provided service is reversed. A collaborative

e-government is enabled, while the government is now a consumer to whom citizens provide useful services and information. Citizen-sourcing implies disruption of the current established processes of a city's authorities and acceptance on change, since these governance processes need to be modified and new processes can be introduced. Various technologies from different sources need to be interconnected this being one of the biggest challenges: integrate diverse technologies, platforms and infrastructures, and use them to achieve common socio-techno-economic objectives.

By using the Sense.City services and applications, citizens are transformed to city "sensors". This is enabled by the integration of a rich set of capabilities like GPS, accelerometer, camera, microphone included today in every mobile device. The platform consists of a mobile application as well as a web application. It offers an open API that can be embedded to other applications.

Sense.City has the following benefits:

- It is open source.
- It offers a mobile application free of charge that can be used by multiple cities without downloading a specific application per city.
- It contains a complete backend management system for managing geofencing, point of interest and fixed points in the city (e.g. city lighting bulbs, garbage bins).
- It offers features such as geolocation, routing, messaging, push notifications and issue recommendations.
- It is multilingual and can be used anywhere in the world.
- It offers an open API for programmers and individuals that would like to build apps on top of the Sense.City API.

One of the most important parts of the Sense.City platform is to make public not only what is happening in the city but also how the public services are performing. The platform's public portal displays what is happening in the city, how many issues are lately reported by users' mobile phones via the Sense.City application, as well as information from social media.

Another feature is the overview of citizens feelings across the city for a specific period of time. The Sense.City mobile application gathers anonymous user triggered feeling status on a specific location and time (similar to Facebook Like/Dislike feature or the rating functions one finds in airports and other locations). This can help public services to analyse city neighbourhoods and people's behaviour under specific conditions and in different locations.

City analytics are used by all levels of administration. A global view of issues analytics is useful by the mayor's office as well as in the Smart City dashboards.

Appendix IV: Bibliography

1. Ministry of Digital Policy, Telecommunications and Information - General Secretariat for Digital Policy (2016), National Digital Strategy 2016-2021
2. Region of Western Greece (2014), Regional Operational Programme 2013-2020
3. Region of Western Greece (2015), Smart Intelligence Strategy for the Region of Western Greece
4. Smart City Group (2017), Business plan Patras – Smart City

Appendix V: Stakeholders consulted

Name	Organisation
Alexandra Sarma	Orange Grove Patras
Alexandros Laskaridis	Municipality of Patras
Alexandros Papageorgakopoulos	Playn.gr
Alkistis Stathopoulou	Management Authority of Development Programmes
Anastasios Tsagadouras	myroutes.gr
Antreas Komninos	Computer Technology Institute & Press "Diophantus" / University of Patras
Antreas Koskeris	Computer Technology Institute and Press "Diophantus" - Center of Telematics and Applications for Regional Development
Aristidis Mamasioulas	Management Authority of Development Programmes of Western Greece Region.
Athanasios Argiriou	Laboratory of Atmospheric Physics, Department of Physics, University of Patras
Athanasios Kalogeras	Local Expert, Industrial Systems Institute
Christos Giovanis	Orange Grove Patras
Christos Kalogeris	Municipality of Patras
Christos Koulamas	Industrial Systems Institute
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Christos Tranoris	University of Patras - Department of Electrical and Computer Engineering
Dimitra Chondrogianni	University of Patras
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Dimitris Trachilis	Patras Science Park
Dimosthenis Polizos	Vice Rector of Research & Development, University of Patras - Department of Electrical and Computer Engineering
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George Oikonomou	Citrix
Georgios Drakopoulos	Cloudminers
Georgios Stefanidis	University of Patras - Department of Electrical and Computer Engineering
Georgios Telonis	Greek Tourism Confederation, Patras Port Authority
Glikeria Katifori	Management Authority of Development Programmes

Name	Organisation
Ilias Aravantinos	Exelixisnet.com
Ioanna Katsonopoulou	Patras Port Authority
Ioanna Papaioannou	Primary and Secondary Education Departments of Achaia
Ioanna Petri	Hellenic Open University
Ioannis Christodouloupoulos	Condis.teiwest.gr
Ioannis Garofalakis	Computer Technology Institute and Press "Diophantus" - Center of Telematics and Applications for Regional Development
Ioannis Kalavrouziotis	Hellenic Open University - Science and Technology
Ioannis Kikidis	Dialog semiconductors
Ioannis Kostopoulos	Sammyacht.com
Irini Kafousia	University of Patras
Irini Vasilopoulou	Municipality of Patras
Konstantinos Bastas	Patras Science Park
Konstantinos Giotopoulos	Development Company and Chamber of Achaia
Konstantinos Mpastas	Patras Science Park
Konstantinos Pantazopoulos	Digital SKG
Kostas Peletidis	Mayor, Municipality of Patras
Kostas Tsekouras	University of Patras - Department of Electrical and Computer Engineering
Lefteris Tzelepis	ATS Traffic Systems
Lena Tshipouri	Team Lead Expert, Dpt of Economic Sciences, National and Kapodistrian University of Athens
Maria Konstantinou	Patras Science Park
Michalis Christakis	Technology Enterprises Association of Western Greece
Michalis Paraskevas	Computer Technology Institute & Press "Diophantus" & Panhellenic School Net
Michalis Vasilakis	Newspaper "Peloponnisos"
Nikos Tsimogiannis	General Secretary, Municipality of Patras
Panagiota Saranti	University of Patras
Panagiotis Papamichail	University of Patras
Petros Ganos	City Representative, Head of Dpt of Planning and Studies, Municipality of Patras
Petros Mantas	Chairman of the Association of Industrial Zone Companies of Patras
Pinelopi Sakoveli	Primary and Secondary Education Departments of Achaia
Sofia Aggelopoulou	Inspectors-Controllers Body for Public Administration
Sotiris Michalopoulos	Computer Technology Institute & Press "Diophantus"
Sotos Kalogirou	Fibair/Citiwave
Spiros Denazis	University of Patras - Department of Electrical and Computer Engineering

Name	Organisation
Spiros Papaspirou	Region of Western Greece (Directorate of Planning Development)
Spiros Sirmakesis	University of Applied Sciences (TEI of Western Greece)
Spiros Spiropoulos	Geotechnical Chamber of Western Greece
Spyros Mazarakis	Playn.gr
Stauroula Mpouzouki	Hellenic Telecommunications & Post Commission
Stavros Chondros	Private Studies Company
Stilianos Karatzas	University of Patras
Takis Triantafyllou	Municipality of Patras
Tanya Politi	Business Representative, Smart City Innovation Hub, Patras Science Park
Thanasis Kalogeras	Industrial Systems Institute
Theodoros Tsoumpelis	Achaia Chamber (former Chamber of Commerce and Industry)
Vagelis Kapoulas	Computer Technology Institute & Press "Diophantus" & Panhellenic School Net
Vaggelis Karachalios	Region of Western Greece
Vasiliki Lazari	Municipality of Patras
Vasilios Aivalis	Technical Chamber of Greece - Department of Western Greece
Vasilios Anastasopoulos	Patras Science Park
Vasilios Kantzaris	Municipality of Patras
Vasilios Kapogiannopoulos	Patras Science Park
Vasilios Ntaloukas	Directorate of Secondary Education New Technology Information Center Of Achaia
Vasilis Aivalis	Technical Chamber of Greece - Department of Western Greece
Vasilis Papaioannou	Municipality of Patras
Vasilis Thomopoulos	Deputy Mayor of Environment, Energy and Planning, Municipality of Patras
Vasilis Triantafyllou	University of Applied Sciences (TEI of Western Greece)
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