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Smart city strategy for City of Dubrovnik

Dubrovnik smart city (DUSC)

July 2015

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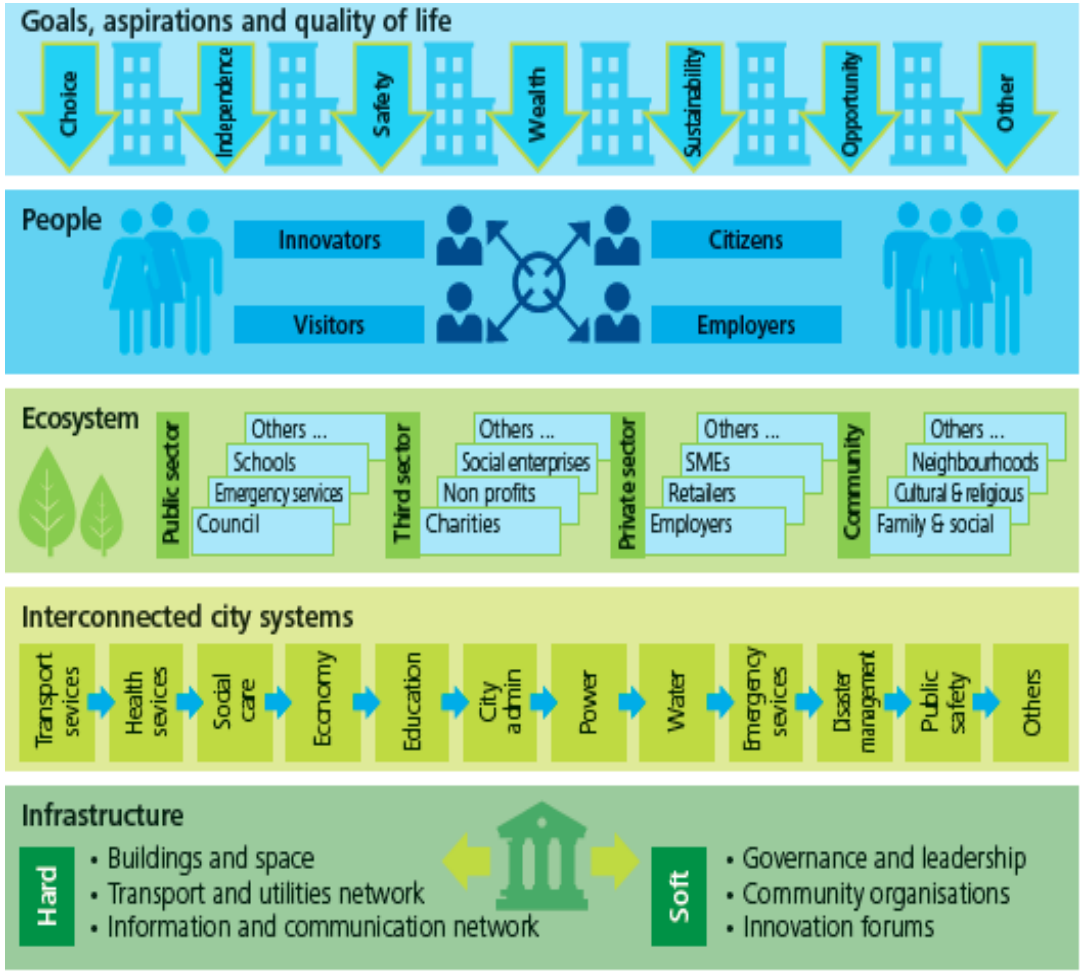
Context for the smart city concept development

ICT is the core of the smart cities as it enables liaisons between all city segments thus creating synergies and cooperation

Within the recent years, the cities have become drivers of economic activities in most countries and the centre of their economic, social and cultural activities. The outlined trends as well as the expected future prosperity of the cities are resulting in ever increasing pressure on the city's infrastructure development, the need for creating synergies through cooperation between key stakeholders, achieving savings and higher efficiency in providing services, additional revenue sources, etc. Aforementioned indisputably shows that the models for managing city infrastructure and services need to adapt to these continuous changes. Besides changing traditional management models, cities need to understand the key sources of value creation and gain alternative perspective on city economic activities and services, **with emphasis on innovation and new technologies which have the ability to create added value.** In this view, the rapid development and implementation of different technological solutions aimed at increasing the city's efficiency is known as the **smart city concept.** Smart cites are those which use the ICT technology to increase infrastructure efficiency and accessibility, and which have a long term strategy for smart and sustainable development. With this respect, the management and development models are also modified to reflect this city's long term development strategy. A **smart city is not, however, a set of partially implemented individual technological solutions in unrelated segments of the city, but a holistic and an integrated concept.** Smart city is therefore characterized by the following:

- Connectivity and interoperability of the city systems, key stakeholders and service providers
- Data collection and crunching as well responding based on the data collected about the city services and activities, all with the goal to proactively and reactively act in the real time
- City and citizens needs analysis through citizens' active participation and cooperation in the city activities, with the goal of increasing the quality of life and the citizens' satisfaction
- Cooperation of the public administration, private sector, academic community and other stakeholders with the aim of stimulating economic activity and long term sustainability of the city

ICT as the core of smart cities ensures connectivity of certain city activities, where connectivity and integration are one of the key smart city characteristics



Smart city strategy for City of Dubrovnik

Dubrovnik has recognized the importance of the smart city concept for achieving its strategic goals and growth, but due to lack of strategy is facing various challenges in the implementation phase

City of Dubrovnik is focused on the **long term holistic development** and improvement of the quality of life for its citizens, which is evident, among others, within the city's various strategic priorities and documents, as well as series of implemented smart city projects. Although much has been done so far, challenges for successful implementation can be observed on the single project level as well as on the whole smart city concept level. Due to lack of a smart city strategy, as well as the appropriate organization and processes, so far the technological solutions were imposed as the key drivers for smart city projects. However, in the future it is necessary to ensure that the development and implementation of smart solutions are conducted solely on the basis of understanding the City's and citizens' needs. Smart city strategy for the City of Dubrovnik should thus ensure a sound base for development of a sustainable and holistic long term smart city concept and offer solutions and priorities which will provide answers to the City's key challenges. Key objectives for the smart city strategy for the City of Dubrovnik are thus as follows:

- Determine long term development vision for the Dubrovnik smart city
- Ensure that the smart city strategy for the City of Dubrovnik is focused on all key stakeholders: citizens, visitors, private sector, institutions, civil society, academic community and public sector
- Determine the degree of maturity for the smart services implemented so far in different city segments and identify key challenges and needs for each of the segments
- Define strategic priorities and goals for the Dubrovnik smart city concept
- Identify strategic projects, which will for each segment or on the City level, contribute to development of the Dubrovnik smart city, i.e. support accomplishment of the overall smart city objectives
- Develop a transformation plan for City of Dubrovnik towards the holistic smart city concept and define an implementation plan for the strategic projects and initiatives

Based on understanding of activities and services provided by the City, i.e. key stakeholders (administrative departments/ institutions, companies owned by the City) 4 key areas of the City's activity are identified. The mentioned areas are the backbone of the smart city strategy. Each of the four identified areas have its own segments, i.e. individual activities and stakeholders. The rest of the strategy, as well as overview of relevant activities, is prepared based on the four proposed areas.

Dubrovnik smart city key areas of activity

Mobility and infrastructure
- Transportation
- Parking
- Infrastructure

Economic development
- Employment and economic development
- Entrepreneurship and innovation
- Tourism and culture

Quality of life
- Waste and water management
- Urban development and landscaping
- Environmental protection
- Youth and sports
- Social care
- Education
- Civil protection

Management and institutions
- Citizen services
- Economic and financial management
- ICT and internal functions support

Smart City Strategy for the City of Dubrovnik

The Strategy was prepared through 3 key phases with close collaboration and active participation of key stakeholders: the City Council, City institutions and City owned companies

1 CURRENT STATE ANALYSIS AND IDENTIFICATION OF SMART CITY VISION AND OBJECTIVES

1. Analysis and understanding of city services and areas and segments of City activities
2. Maturity assessment of current smart city services and identification of future development needs
3. Definition of smart city vision and objectives

2 IDENTIFICATION AND DEFINITION OF SMART CITY STRATEGIC INITIATIVES

1. Identification and development of strategic initiatives and projects
2. Preparation of high level business cases
3. Definition and development of key performance indicators system

3 PREPARATION OF INITIATIVES IMPLEMENTATION PLAN

1. Prioritisation of strategic initiatives
2. Preparation of implementation plan of the smart city strategic initiatives

Smart city strategy for the City of Dubrovnik

Individual steps applied in developing the smart city strategy for the City of Dubrovnik were developed with a clear understanding of the overall development objectives

Current state analysis and identification of smart city vision and objectives

First phase in drafting the smart city strategy required understanding and analysis of existing services provided by the City, i.e. services provided by the key stakeholders (administrative departments/ institutions/ companies owned by the City) as well as already implemented smart city projects. Analysis was conducted based on review of available documentation, City's and key stakeholders' strategic documents, workshops with city representatives and a survey conducted among more than 33 participants. Based on aforementioned, key areas and segments were identified: mobility and infrastructure, quality of life, economic development and management and institutions. Smart city maturity assessment was also made prepared based on the smart city maturity model criteria. The latter. alongside the identification of city needs in four segments of activities, enabled identification of the Dubrovnik smart city vision and objectives, on the City level and on the level of individual segments.

Identification and definition of smart city strategic initiatives

Second phase in drafting the smart city strategy was built upon the results of the analysis conducted during phase one. Namely, based on the identified level of maturity of the existing smart city services as well as needs, challenges and objectives for individual city segment, a set of strategic initiatives were identified. Implementation of the relevant initiatives contributes directly to the establishment of the smart City of Dubrovnik. A high level business case was prepared for each of the identified initiatives, assessing the level of effort needed for the initiative's implementation as well as considering potential benefits of the implementation of the initiative. In order to ensure monitoring of the initiatives implementation, i.e. developing City of Dubrovnik as a smart city, a set of key performance indicators (KPIs) was developed. Monitoring of the key performance indicators is one of the key characteristics and tasks of a smart city. Please note that for the purpose of the Strategy, only an initial set of key performance indicators was developed, whilst it is on the City and relevant stakeholders to further develop the KPIs base, based on future needs.

Preparation of the initiatives implementation plan

Implementation plan for the selected smart city initiatives was prepared in the last phase of drafting the smart city strategy. Prioritization of the strategic initiatives was conducted considering expected implementation costs and benefits, and a time component. In this view, the strategic initiatives implementation plan was prepared for short, medium and long term and for different project types: the enabling projects, quick-win projects, transformation projects and complementing projects.

Maturity assessment of existing smart city services and needs identification

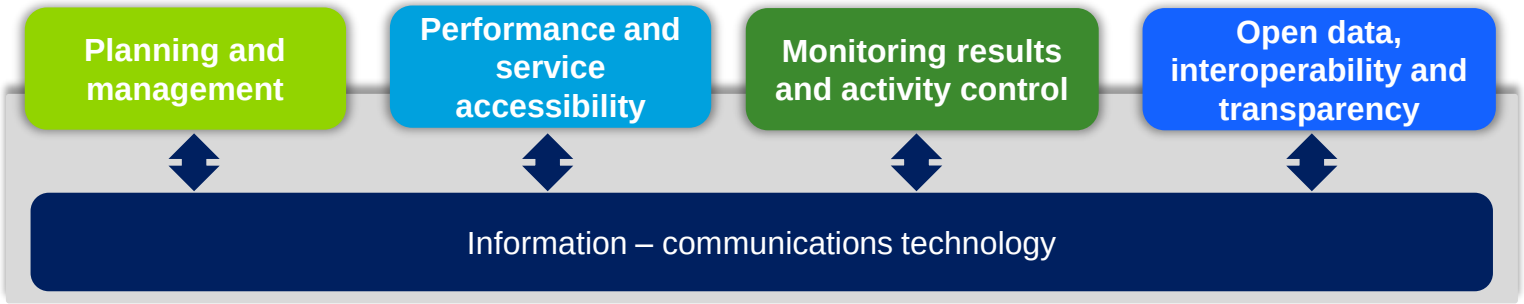
Maturity assessment for existing smart services was prepared with respect to the desired characteristics and best practice smart city concepts. For the City of Dubrovnik, the analysis indicated on the low to moderate degree of maturity for most city segments as well as pointed to some common smart city needs on the City level

A maturity assessment model for the smart city services was developed with the aim of understanding the specific smart city development and implementation needs of the City of Dubrovnik. With this respect, the smart services were assigned to certain stakeholders (administrative departments/ institutions/ companies) and analysed within the previously mentioned City segments. Detailed overview of identified areas, stakeholders and services can be found in Appendix 2 to this document.

In addition to the maturity assessment for each service provided by the City that is the stakeholders, the model and the analysis also allowed to obtain understanding of the key processes and activities, means of monitoring and measuring effectiveness, current state analysis of the IT services and infrastructure, key challenges as well as future planned projects. Understanding was gained through the information obtained from the survey and workshops conducted with more than 22 City/ administrative departments/ institutions and company representatives (71% of total number). The latter alongside the results of the maturity assessment was the basis for identification of smart city objectives and strategic projects. Questions from the survey and the workshop attendees can be found in Appendix 4 to this document.

The smart city maturity assessment model was developed so that the same reflects the key characteristics of a mature and comprehensive smart city concept. The maturity level of the smart services can within vary from low, moderate to high maturity and the same is provided for each of the segments by the key activity areas (mobility and infrastructure, quality of life, economic development and management and institutions). Assessment of the maturity level for the City of Dubrovnik smart services was made based on the received survey results, workshops with stakeholders and review of existing services' documentation. A detailed overview of the smart city maturity model and results is presented on the following slides.

Model for assessing existing smart services degree of maturity



Scale of maturity level for existing smart city services

Low	*1,2*
Moderate	*3,4*
High	*5,6,7*

Maturity assessment of existing smart city services and needs identification

The maturity assessment model for the smart city services reflects the desired characteristics of a smart city and provides a scoring to reflect different maturity levels

Planning and management

1. Strategy

Are smart services developed in a planned manner, in line with city strategy and in cooperation with the key stakeholders.

2. Organization

Is there a dedicated team of experts for smart services development on the city level

3. Processes

Is there a formal and single process for developing the smart city services and initiatives, including procedures for business case preparation.

Performance and service accessibility

1. Service accessibility and citizen participation

Is the smart city service easily accessible and recognizable. Are smart services developed based on understanding of the citizens' needs and their active participation.

2. Effectiveness and efficiency in service model management

Are smart services managed and planned using adequate technologies, tools for forecasting resource consumption, with the objective of maximizing savings and providing high quality services.

Monitoring results and activity control

1. Monitoring and control

Are the data regarding effectiveness of provided services regularly monitored, are there any actions, in real time, as a result.

2. Measuring effectiveness

Is there, on a city and stakeholder level, key performance indicator system implemented, for monitoring smart services effectiveness.

Open data, interoperability and transparency

1. Open data

Are smart city data managed in a structured and strategic way, and are data shared with third parties.

2. Interoperability

Is it possible to share solutions, data and information between the stakeholders.

3. Transparency

Is transparency regarding stakeholders activities and services ensured.

Degree of maturity

- Low
- Moderate
- High

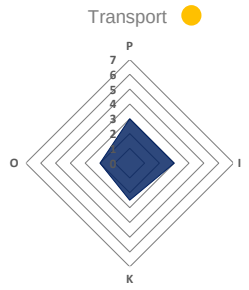
Information – communications technology

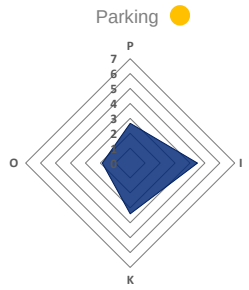
Does the existing ICT infrastructure adequately meet stakeholders' needs for development and implementation of smart services and is it acquired strategically..

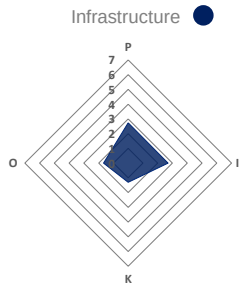
Maturity assessment of existing smart city services and needs identification

Overview of degree of maturity of the existing smart city services within the City of Dubrovnik

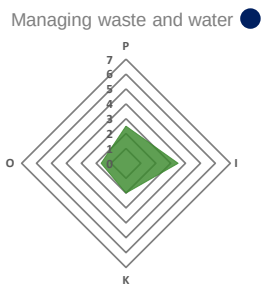
Mobility and infrastructure

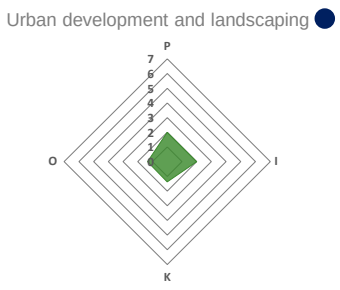


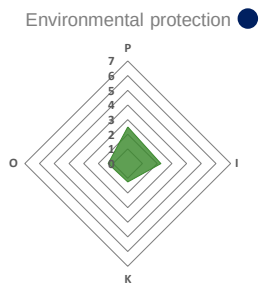


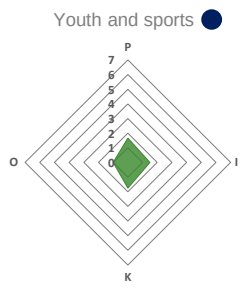


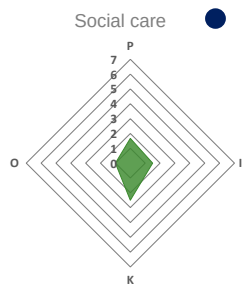
Quality of life

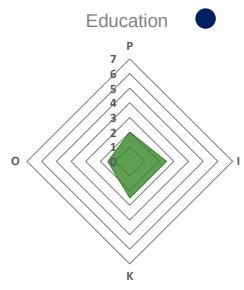


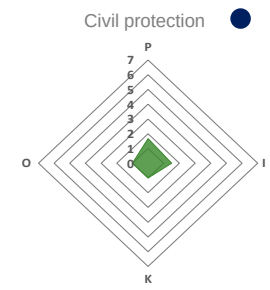




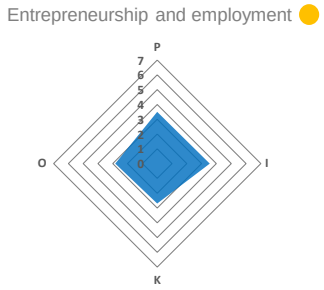


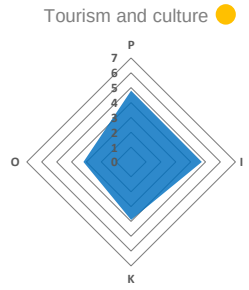




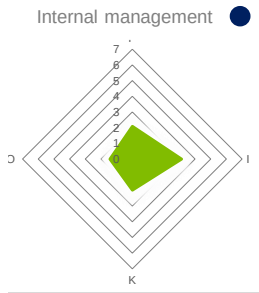


Economic development





Management and institutions



Legend:

Degree of maturity of the smart services

Low maturity	(1,2)
Moderate maturity	(3,4)
High maturity	(5,6,7)

Key criteria used to determine the degree of maturity of the smart services

P – planning and management;
I – performance and service accessibility;
K – monitoring results and activity control;
O – open data, interoperability and transparency

Maturity assessment of existing smart city services and needs identification

Low maturity level was observed regarding key characteristics necessary for establishing and implementing a comprehensive smart city concept

Degree of maturity of existing smart city services

- Stakeholders are primarily driven by the available technological solutions when developing smart services and less by the strategic and operational needs of the organization. Also, business cases are not developed to assess the benefits and costs of a solution implementation.
- Smart services are made available to the citizens through various channels, but the level of transparency regarding achieved results and launched projects is not sufficient. Additionally, citizens participation in developing and identifying necessary smart services is at large still limited and citizens are primarily involved in the final phases of the project implementation.
- Even though the key performance indicators are monitored on administrative department/ institution/ company level the same are not developed primarily for monitoring the smart services. In addition, the KPI values are not used for any feedback action that should result in increased efficiency of provided services and establish responsibility for achieved results. Gathering, analysing and distributing the KPI data is not unified on the City level.
- Existing ICT infrastructure is primarily limited to the legacy systems of different stakeholders that provide certain smart services. New equipment was not procured in an strategic way with the goal of getting infrastructure that would support City needs on a wider level and be shared by all stakeholders. Existing infrastructure that would support broadband Internet is not sufficiently developed on the City and Dubrovacko – Neretva county level.
- Interoperability, scalability and multifunctionality criteria are not met by the current ICT infrastructure and the same is at large limiting data sharing, cooperation and networking between City stakeholders. Aforementioned partially results in reduced synergy effects, implementation and use of certain smart services at individual user level as well as reduced resources savings.
- Maturity assessment of existing smart city services indicated that services are characterized by low level of data sharing i.e. application of open data concept. Smart city standards are not developed nor the data is managed in a systemic and objective driven manner.

Future development needs

- Ensure centralized strategic and operational support to all activities related to smart city services, with necessary user coordination, with the goal to create synergies
- Stimulate using mechanisms and technologies that will ensure citizens participation in developing and implementing smart city services and higher transparency of city administration
- Ensure easy access to smart services for citizens through planned development of the City card, with the aim of better understanding citizens needs and behaviour
- Develop central Dubrovnik smart city platform which will ensure data gathering and analysis from various sources, processing and sharing data with the goal of obtaining feedback in real time, in order to improve service quality
- Promote interoperability and developing data standards on City level to ensure integration and cooperation of different stakeholders' systems
- Develop management strategy for data storing, openness, data sharing and privacy on the City level

Dubrovnik smart city vision and conceptual model

Through implementation of a holistic smart city model, the City of Dubrovnik wants to strengthen its existing competitive advantages by using technologies and to increase the quality of life for the citizens, ensure competitiveness and long term sustainability

Vision for the Smart City of Dubrovnik

The City of Dubrovnik strives to become a Hi-tech, socially and environmentally conscious, entrepreneurially oriented, safe city and an internationally recognizable brand with focus on the welfare of the citizens. The latter is to be achieved through implementation of the smart city concept, i.e. connecting, aligning and optimizing the technical and process wise aspects of all of the City's stakeholders.

Objectives of the smart City of Dubrovnik

(quality of life, competitiveness and sustainability)

Quality of life

Bring public administration and the educational system closer to the citizens by aligning the City services with the needs of the citizens and by making them more accessible, affordable and faster.

Service efficiency

Optimize costs, generate savings and increase efficiency of utility services through real time service management.

Smart services in culture and tourism

Increase City revenues from tourism and cultural activities by using technology and developing new services.

Internal efficiency

Optimize and improve the business/ organizational processes for the City and all relevant stakeholders by using the smart city concept

Dubrovnik smart city vision and conceptual model

Objectives of individual segments are built upon their future development needs and are focusing on the quality of life for the citizens, business competitiveness and a long term sustainability of the environment and City of Dubrovnik

Mobility and infrastructure

1. Establishment and continuous development of a smart and integrated mobility system in Dubrovnik
2. City infrastructure efficiency and sustainability

Quality of life

1. Transforming city utility services and the approach to overall urban development management
2. Technology as a tool for social innovation and citizens inclusion
3. Public administration transparency and openness
4. Smart city services focused on the citizens

Economic development

1. Promote smart city concept as part of the overall working and living culture
2. City of Dubrovnik recognized for smart tourism and smart culture

Management and institutions

1. Ensure digitalization of City's activities and services
2. Strengthen the concept of interoperability, open data and scalability

Dubrovnik smart city strategic program

- The strategic programme of the smart City of Dubrovnik was prepared based on the identified on the City of Dubrovnik's smart city objectives as well as specific needs and challenges identified during the Project assessment phase.
- The strategic programme consists of an overall of **17 smart city projects whose implementation should contribute to development of the City of Dubrovnik smart city concept as a whole.**
- High level business case was prepared for each of the 17 projects, and the same assessed, on a high level, the expected benefits and efforts needed for a specific project implementation.
- Projects were prioritized based on their relevance for implementation of the smart city concept as a whole and by considering the overall time dimension for the project implementation (short term, medium term, long term)
- Detailed overview of the project implementation plan is presented on the following slides with outlined enabling projects, projects with benefits in short term („quick-win" projects), transformational and complementing projects

* It is expected that before project initiation, a formal contract will be signed regarding stakeholder joint cooperation on the smart city concept. The contract will enable stakeholders responsibility for project implementation. It is necessary to ensure central support and coordination from DUSC Smart city office for the every project.

Dubrovnik smart city strategic program

Projects are rated and prioritized according to the City's priorities and expected benefits and effort needed for the project implementation

Smart city strategic projects were reviewed in the next steps of developing the smart city strategy and for each project a **high level business case for project implementation was prepared.** Projects were added with a time dimension, which was one of the criteria used for developing a **high level implementation plan and project prioritization approach.** Each criteria used for the implementation plan and project prioritization approach is further explained below.

High level business case

Expected BENEFITS from project implementation

- Rating projects according to expected benefits (resources, financial, qualitative, etc.), which would be achieved for (i) citizens and (ii) City of Dubrovnik, provided the project is implemented

EFFORT NEEDED for project implementation

- Rating projects according to effort needed for project development and implementation (financial, organizational, technological, etc.)

Smart city projects prioritization

IMPACT on implementation of a smart city concept as a whole

- Rating projects according to the impact the project implementation would have on the City of Dubrovnik and the citizens in further development and implementation of the smart city concept or alternatively rating projects if they are considered as a precondition for implementation any other strategic projects (e.g. the DUSC Smart City Office)

TIME DIMENSION of project implementation

- Time dimension considers the short term period with < 3 years needed for implementation of projects that set the basis for the future smart city and of projects which bring benefits in short term („quick-win" projects). Medium term projects require longer time period for implementation (3-5 years) and have significant effect on the citizens and The City. Long term projects (> 5 years) contribute to the overall smart city concept, but are not considered as priorities from the City of Dubrovnik point of view.

Dubrovnik smart city strategic program

Project implementation benefits were considered in context of potential benefits that would arise for the citizens and the City, i.e. stakeholders' benefits

Project benefits expected

Observed dimensions	Rating criteria	Criteria description
Citizen benefits	**Effectiveness of provided services**	*Does the project contribute to savings of time and money, necessary for using the service?*
	Quality of life and citizens satisfaction	*Does the project contribute to higher quality of life for the citizens in different aspects as well as in higher satisfaction from provided service?*
	Citizens participation	*Does the project contribute to higher participation of citizens in city activities and developing smart services through different channels and types of communication?*
City of Dubrovnik benefits*	**Effectiveness of provided services**	*Does the project contribute to a higher service provider effectiveness and new revenue sources? Does it secure managing activities in real time?*
	Effect on the City' sustainability and competitiveness	*Does the project improve socio-economic conditions in the City and long term resources sustainability?*
	Public administration effectiveness	*Does the project contribute to higher transparency and effectiveness of public administration?*

* Service providers and administrative bodies

Each strategic project is rated on the scale from 1 to 7 according to described criteria, and each project is given total expected implementation benefit.

Potential level of benefit

Low	Moderate	High
1,2	*3,4*	*5,6,7*

Dubrovnik smart city strategic program

Effort needed reflects expected costs and efforts required to implement the project

Effort needed for project implementation

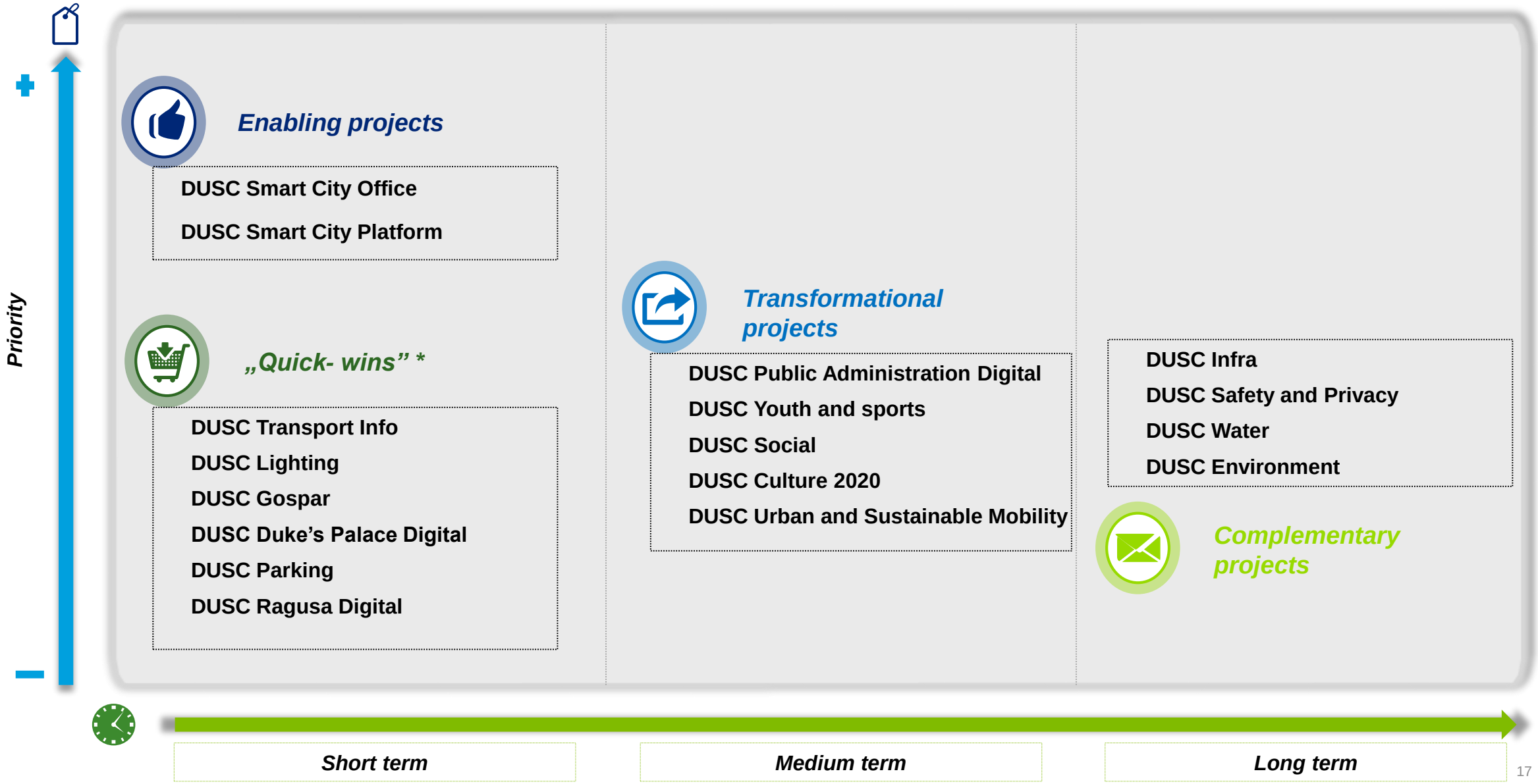
Observed dimensions	Rating criteria	Criteria description
Investment profit	**Investment needed**	*What is the range of project investment needed?*
	Implementation duration	*What is the estimated project implementation duration?*
	Benefits realization term	*What is the deadline for project benefit realization?*
Technological aspect	**Technologies needed**	*What is the investment needed in existing and new technology to secure project implementation?*
Human resources	**Knowledge and skills needed**	*Are there available human resources with adequate knowledge and skills set to implement project?*
	Resistance to change	*Can citizens/ employees resistance be expected?*
Organization and processes	**Organizational needs**	*What it the level of adjustment necessary to current organization, processes and procedures to implement the project?*
Stakeholder impact	**Citizens**	*What is the degree and extent of project impact on citizens activities and lives?*
	Visitors/ tourists	*What is the degree and extent of project impact on visitors/ tourists?*
	Other stakeholders*	*Does the implementation affect other stakeholders?*

*** Regional and national government bodies, local services, civil organizations, etc.**

Effort needed

Low	Moderate	High
1,2	*3,4*	*5,6,7*

Dubrovnik smart city strategic program



Dubrovnik smart city projects

1

Project main objectives

- Ensure central coordination and development support to smart city projects as well as ensure the City's capacity strengthening
- Contribute to development of interoperability and data standards
- Promote innovation and economic development activities
- Ensure implementation support to smart city initiatives and projects
- Promote Dubrovnik smart city concept and brand
- Promote and coordinate open data initiative

Planned project activities

- Development and implementation of Office for management and implementation of the Dubrovnik smart city concept
- DUSC Smart City Office should:
  - become central coordination and communication body for the smart city purpose
  - ensure supervision and monitoring of smart city activities
  - promote the City of Dubrovnik smart city concept and brand
  - ensure smart city capacity strengthening
  - initiate innovation and development
  - manage open data concept

2

Project main objectives

- Support in development of interoperability with the goal of creating simpler and more efficient data exchange through the smart city platform
- Enable a monitoring system for the key performance indicators
- Integrating DUSC Smart City Platform with City services and departments
- Establish a technological base to achieve scalability, modularity and flexibility to ensure continuous development of new smart city solutions and services with same standard
- Promoting further development of Wi-Fi, i.e. broadband network

Planned project activities

- Platform is a central place for gathering all information and indicators regarding City services and the City itself
- Platform will ensure:
  - gathering smart city indicators
  - improve the effectiveness of the City's management model through easier data sharing among stakeholders
  - public administration transparency and openness
  - create basis for sustainable growth through providing services and using resources more effectively
- Platform will have to meet conditions regarding connectivity, scalability and openness

Dubrovnik smart city projects

3

Project main objectives

- Provide information in real time and enable better transport planning and management
- Provide information in real time
- Increased transport safety
- Higher quality of life through reducing traffic jams and average length of travel
- Pollution and noise reduction
- Public transport cost reduction
- Public transport increased attractiveness

Planned project activities

- Introducing a single centre for centralized city transport management (public and other transport)
- As part of the project it is necessary to introduce technological solutions for monitoring transport (cameras, sensors, dynamic option traffic lights, etc.)
- Using different communication channels, i.e. different technological solutions to provide citizens with key transport information

4

Project main objectives

- Promoting the use of new technologies for public lighting development and management
- Reducing public lighting energy consumption
- Promote citizens active participation to adjust the level of public lighting to the citizens' needs
- More efficient use of city resources
- Achieving a positive impact on the environment through reduced heat and energy emission

Planned project activities

- Establish smart lighting management system with the goal of control and reducing energy consumption
- Establish interoperable lighting solutions which will gather relevant data using appropriate technology (e.g. motion sensors, smart meters, etc.) to optimize lighting levels and energy consumption
- Additional development possibilities are possible by connecting other smart systems trough lighting polls (e.g. electric cars charging stations, waste management, etc.)

Dubrovnik smart city projects

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Project main objectives

- Developing standards for smart city services to maximize citizen satisfaction
- Monitoring smart city indicators to ensure continuous improvement of smart city services
- Continuous smart city services improvement through tracking citizens needs, expectations, suggestions and demands
- Ensure easy usage of services through different tools, primarily the city card
- Ensure maximum efficiency when using City resources.

Planned project activities

- Continue with implementation of the City smart card project with emphasis on developing additional functionalities (used for identification, transport, e-wallet, discounts, etc.)
- Appropriate technology should support the usage of City smart card and it should be selected based on anticipated implementation costs and benefits criteria
- Understanding trends and citizens needs would ease the development of new services

6

Project main objectives

- Public administration transparency and openness
- Ensure relevant data and information availability in appropriate formats to facilitate further application development
- Citizens participation in developing and implementing services to ensure maximum satisfaction
- Develop rules and standards for sharing City information with third parties
- Ensure citizens participation in developing smart services

Planned project activities

- Creating platform that will consolidate City's threefold roles in one place:
  - provide citizens with all relevant information regarding City activities and results to ensure transparency in the City management
  - citizens participation in different smart city aspects
  - provide access to open data collected and analysed by the smart city to allow their future use and development of new solutions

Dubrovnik smart city projects

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Project main objectives

- Allow possibility to monitor availability of available parking spaces in real time and managing supply of the same
- Reducing traffic jams by reducing the time needed to find an available parking space
- Time savings for the citizens
- Increasing City's parking revenues
- Reducing pollution and noise

Planned project activities

- DUSC Parking anticipates usage of smart solutions in the parking segment
- Smart parking management system anticipates usage of sensors and/ or other appropriate solutions for better City parking management
- Connecting technological solutions with Smart City Platform enables processing, i.e. creating data regarding parking spaces availability and location, in real time

8

Project main objectives

- Further development of the City's tourism, tourist offer, as well as the level of quality of provided services, by using technology
- Ensure real time monitoring of tourist movement habits and interest shown to further adjust the City's tourist offer
- Ensure multichannel communication toward visitors and easy service access
- Raise the number of visitors, as well as spending, during their stay in City of Dubrovnik

Planned project activities

- Project is set on deployment of new technologies in the existing City infrastructure and services to improve visitors overall experience during their stay in the City of Dubrovnik
- Development of individual initiatives and solutions should be the preceded by the usual smart services development process which requires: current state analysis to identify segments that are appropriate for application of new technologies and analysing potential technological solution.
- The project will promote the use of a proactive approach to the management of the tourist offer by understanding tourist expectations and services quality received during their stay in City of Dubrovnik.

Dubrovnik smart city projects

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Project main objectives

- Promoting City services development and implementation in the e-form
- Saving citizens time and ensuring higher service quality
- Ensure efficient use of City resources by implementing document management system and creating a digital data base
- Monitoring efficiency in solving citizens' requests and activities within City administrative departments

Planned project activities

- The project anticipates development and standardization of the City's electronic records system. The latter should ensure that all electronic documents and procedures are in line with the characteristics and in format required by the technical standards for interoperability of electronic documents
- Prior to project implementation it is necessary to undertake a cost benefit analysis and define required technical, business and functional characteristics of the future solution.
- Project also envisages the introduction of a large number of e-services for the citizens in order to increase service efficiency

10

Project main objectives

- Facilitate and promote participation of youth in the City activities
- Adjust the cooperation and communication between youth and the City through new technology and use of alternative communication channels, with the goal of providing useful information to the youth
- Improve sports services quality by using technology (mobile apps, social networks, online booking, etc.)
- Establish an online register for the City's sports objects as well as any related information
- Informing youth and citizens about sport events and activities in City
- Enable the possibility of active monitoring of available sport infrastructure and sports activities in the City

Planned project activities

- Project aims to contribute to achievement of the City's development and communication objectives by using technology and development of:
  - Youth portal – provide youth with all relevant information regarding span of opportunities and activities and contribute to direct and two way communication. Prior to implementation, it is necessary to make a detailed breakdown of youth requirements and needs regarding communication, platform operating model, etc.
  - Introducing new technologies for sports promotion – create new and improve existing communication channels with citizens and sports stakeholders. Potential communication channels are the information portal, mobile applications and social networks.

Dubrovnik smart city projects

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Project main objectives

- Ensure a platform for integrated program management and initiatives in social care segment with the aim to provide services of higher quality and with easier access
- Ensure City social care program digitalization and interoperability to enable data and information exchange with other City programs
- Develop a system for monitoring program efficiency, integrated segmenting and monitoring of users
- Ease the access to the key information regarding social care programs

Planned project activities

- Project anticipates the use of technology for activities which strive to integrate the social care system, facilitate the service provision as well as use of programs for the users themselves and ensure better and more effective program management through:
  - creating a single web platform which will enable citizens access to key information
  - developing social smart cards for social care users
  - developing an integrated social care management system

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Project main objectives

- Ensure preservation and visibility of cultural heritage by using technology
- Increase quality and attractiveness of the City's cultural offer by using technology
- Ensure ease of use and access to cultural services (i.e. cultural offer) of the City of Dubrovnik
- Facilitate cooperation between stakeholders in culture and contribute to development of the City's culture and creative industry
- Ensure visibility of cultural services and products

Planned project activities

- Project strives to reflect and integrate different technological solutions which would contribute to realization of strategic goals in the cultural segment and contribute to higher quality of life for the citizens
- The objective is to integrate technological solutions into the City's cultural offer. Detailed breakdown and cost benefit analysis should be conducted prior to implementing any solutions.
- Use of technology should:
  - ensure new channels and promotion possibilities of the City's cultural heritage to citizens and visitors
  - promote development of an online platform in culture which would be primarily oriented to stakeholders in culture, that is contribute to the overall City culture development

Dubrovnik smart city projects

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Project main objectives

- Promoting development and implementation of an urban and sustainable transport in the City of Dubrovnik.
- Introduction of e-vehicles and charging stations in the City
- Divert traffic from most frequent routes in the City to reduce traffic jams
- Promote use of sustainable forms of traffic
- Reduced CO2 and gas emission

Planned project activities

- Development and implementation of an integrated transport system is one of the key priorities for the City's transport development
- Identified on a strategic level the need for integration of Dubrovnik Airport and bus terminal for suburban and intercity transport with Port of Gruž
- Project will promote different forms of sustainable (pollution) free mobility and innovative technologies in public transport, and in other segments of public transportation. Additionally the project will promote the use of technologies which will optimize tourist and pedestrians routes, and thus reduce traffic jams

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Project main objectives

- Establishing a comprehensive asset database
- Optimal use of the existing GIS system
- Optimization of the asset maintenance system
- Establishing an asset management strategy
- Establishing a system for monitoring the energy efficiency
- Reduced energy consumption in the City of Dubrovnik

Planned project activities

- Project aims to unify and upgrade existing City asset databases into a comprehensive asset registry
- Project envisages a gradual development of a building management system for the assets owned by the City
- The system should contribute to monitoring the City's success in achieving its energy efficiency targets by monitoring the energy efficiency indicators
- Establishment of a unified asset monitoring and management system is expected to followed by an asset management strategy as well

Dubrovnik smart city projects

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Project main objectives

- Establish a framework and mechanisms to ensure security and privacy of data collected through the smart city activities
- Protection from information and similar risks
- Raise confidence level of citizens, visitors and third parties regarding data security and confidentiality
- Define data access and usage control systems

Planned project activities

- Project envisages to establish best practices and standards which will ensure smart city safety and privacy, as well as develop processes regarding regular smart city safety and privacy risks monitoring. Anticipated activities are:
  - assigning responsibility to dedicated team of experts
  - preparing and publishing privacy rules
  - developing a system for managing information risks
  - defining processes and establishing regular audit and system controls

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Project main objectives

- Efficient management of water resources in the City of Dubrovnik
- Reducing costs related to water supply for the City and the citizens
- Proactive solutions for any water supply problems
- Efficient quality control
- Ensure information regarding water resources availability and quality to citizens
- Ensure better water consumption forecasts

Planned project activities

- Project envisages development and implementation of advanced technologies for better understanding of the water supply system as well as forecasting potential problems within the network
- System should provide precise identification of the problematic areas and prevent further losses and failures, regulate pressure levels, ensure better asset management and prioritisation maintenance cases
- Trough the future City platform, system activities can ensure integration with other systems and ensure potential additional uses of the system in any other service segments that have some elements of water supply

Dubrovnik smart city projects

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Project main objectives

- Establish a consolidated overview of all green surfaces in the City (green surfaces cadastre)
- Proactive approach to air quality measuring and preservation
- Promote environment protection by use of technology
- Ensure information regarding quality of air and environment to the citizens
- Promote educational and development activities related to the environment
- Establish a consolidated overview of noise pollution in the City of Dubrovnik area
- Establish a consolidated overview of light pollution in the City of Dubrovnik area
- Proactive approach to preservation and measuring quality of air and sea
- Provide the citizens with information regarding quality of sea

Planned project activities

- Project envisages implementation of activities which are focused on continuous care for environment in different aspects. Activities use advanced technologies and solutions based on information – communication technologies
- The project should allow to connect the environment management system with other smart systems in the City, by using the planned smart city standards, i.e. DUSC smart city platform
- A system for measuring air quality should be developed and implemented as part of the project. System will be used to gather data, analyse air quality, pollution level, etc.
- In addition, the project should include activities related to mapping potential polluters as well as protection measures. Activities related to establishment of a single overview of noise pollution on the City of Dubrovnik area should also be conducted.

Dubrovnik smart city key performance indicators

The initial DUSC key performance indicators system has been established to facilitate monitoring success of implementation of the strategic projects as well as of other smart city objectives

Key performance indicators („KPI") were developed on the level of every smart city strategic project. Based on the KPIs and added general indicators for each of the four segments, i.e. City activity areas, initial Dubrovnik smart city performance indicators base was established, and can be found in the appendix of the Strategy. The initial performance indicators base needs to be upgraded through development and implementation of individual projects and the smart city concept itself, deeper understanding of socio-economic characteristic and City's needs, developing new smart city goals, etc. Development and maintenance of the indicators base should be the responsibility of the DUSC smart city office.

Considering that smart city results will primarily be reflected on the quality of life and satisfaction of the citizens, and the City's success and progress, indicators were been divided in two key groups, according to expected results of provided services on key stakeholders (citizens and City). In this view, please note that the City indicators relate both to the City as local government as well as providers of services, administrative departments and companies owned by City. Short description for every KPI category is provided below:

- City services perception and satisfaction indicators for citizens and visitors (quality and added value perception)
- Indicators regarding benefits resulting from implementation of smart services
- Providing basic statistical and other information regarding citizens and visitors that enable comparison between different cities and determine quantitative parameters that define the city profile

- City level indicators measure efficiency and effectiveness of smart city services provided by key stakeholders (administrative departments/ institutions/ companies)
- Indicators measure achievement of objectives set by the smart city strategy, as well as targeted results for a specific project
- Indicators are mainly quantitative to enable monitoring progress and ensure implementation of corrective measures when needed

Dubrovnik smart city reference architecture

Synergies and cooperation between large number of city stakeholders lie in the core essence of the smart city concept. City platform is in this view considered to be the main tool for coordination and cooperation

Among technological trends that dominate the smart city concept, the **city platform** stands out. The main objectives of the city platform is to obtain control over city services, manage data and communicate toward third parties, primarily citizens.

The platform is necessary for developing the smart city concept as it enables a holistic overview of over city activities, ensures standards for the city services, facilitates combined activities for all services and acts as a central coordinating infrastructure. In the City of Dubrovnik smart city context and the smart city development strategy, future city platform is called the **DUSC – Dubrovnik Smart City platform.**

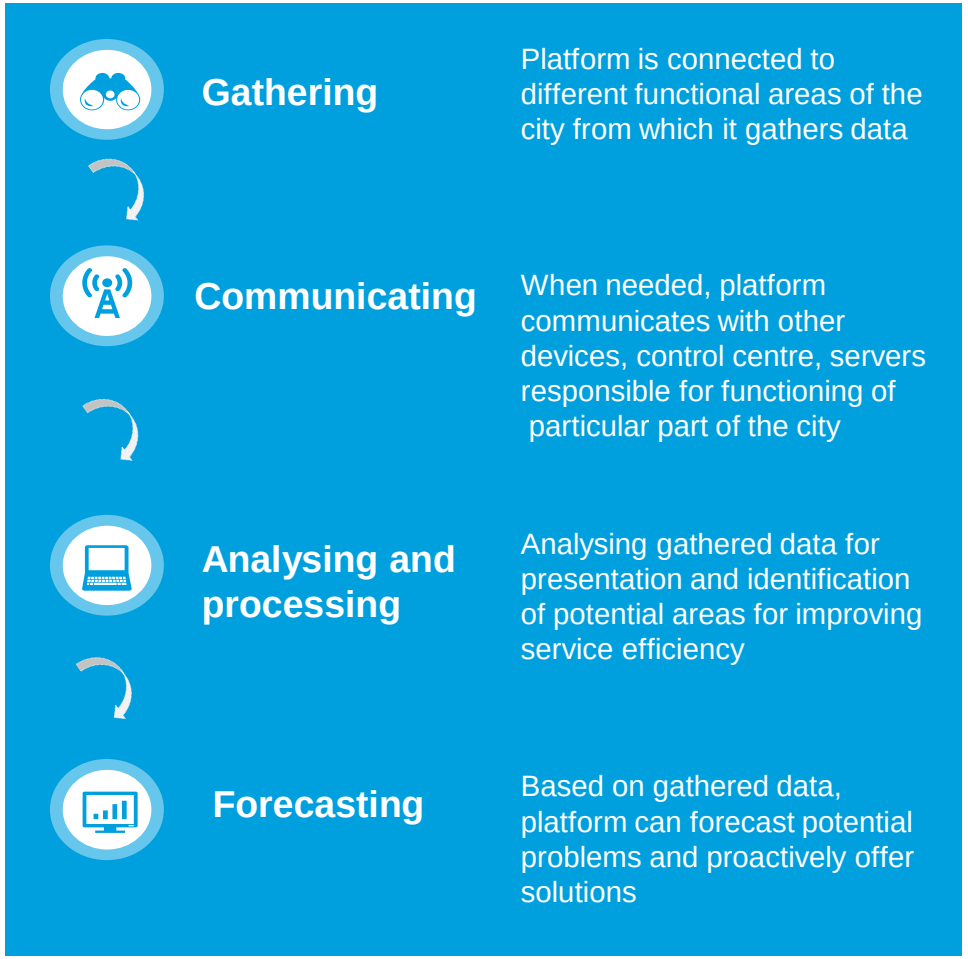
The DUSC platform needs to meet certain key **objectives** as outlined below:

- **ensure gathering of smart city indicators**. Indicators measure parameters related to quality of life and management of city services
- **improve efficiency of the City governance model t**o ensure easier collaboration between different stakeholders (citizens, institutions, academic community, entrepreneurs, etc.)
- **contribute to transparency and openness of public administration** through data availability (comprehensive, consistent and unified)
- **create a basis for sustainable development** through an efficient service provision and resource consumption

In addition to the above outline objectives, the future platform should meet the following characteristics:

- connectivity
- interoperability
- scalability

Smart city platform main functionalities and roles



Dubrovnik smart city reference architecture