Deliverable 3.1.6: Report on the opportunities for SMEs to fully participate in the market of smart city solutions

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Introduction

As cities continue to grow, so is the number of challenges they are facing. Large-scale processes such as growing urbanization and population growth, environmental degradation and climate change lead to the emergence of environmental, economic or social challenges.

Between 1965 and 2015, urbanization around the Mediterranean increased by 75% (United Nations Environment Programme (2020), State of the Environment and Development in the Mediterranean). The south and east Mediterranean areas are especially urbanizing more rapidly than the rest of the world. In addition, the Mediterranean Region is also one of the world's hotspots for climate change, with a higher forecast of temperature rise, droughts and changes in rainfall patterns (IPCC special report (2015), chapter 3. Global warming).

These challenges require cities to find and implement new urban solutions. Innovators, entrepreneurs and professionals across the industry work to develop new solutions. These innovative solutions have a major role for improving urban environments, but the question remains whether municipalities are ready to embrace these solutions? Readiness for adoption and implementation of these new opportunities holds remarkable opportunities for both the city environment, the city residents and to the growing number of small and medium sized innovative companies (SMEs).

The objectives of the SME4SMARTCITIES project are to support the development of new efficient, smart and sustainable products and services that answer to the urban challenges faced by Mediterranean cities, to support the entry of Mediterranean technological and innovative SMEs in the market of smart cities to create new solutions under a demand-driven approach, to improve their competitiveness and their capability to create new knowledge resulting from cross-border cooperative processes (between SMEs and with their potential buyers – the cities).

This document outlines the opportunities for SMEs to fully participate in the market of smart city solutions by reviewing current channels and trends and by providing resources and guidelines for SMEs. It is based on the results of the studies and surveys conducted during the WP3 stage of the SME4SMARTCITIES project, the work conducted with city officials and with SMEs during the project and the current directives and guidelines for sustainable and “green” procurement.

These studies and surveys include:

- An Inventory of the technological and innovative existing solutions for answering smart cities needs (A3.1.1)
- Current procurement trends study and guide (A3.1.2)
- urban challenges and readiness study (A3.1.3)
- The cities project support group engagement (A3.1.4)
- Mapping the opportunities of the smart city market (A3.1.5)
- Identification of the training and capacitation needs of technological and Innovative SMEs (A3.2.1)
- Identification of the existing and needed support services for SMEs (A3.2.2)
- The SMEs project support group engagement (A3.2.3)

This document complements this array of studies and deliverables to provide a full picture of the needs, challenges and readiness of cities and of the opportunities, services and procurement directives and channels available for SMEs in the Smart Cities market.

The following steps in the SME4SMARTCITIES project will be to create and provide a body of knowledge and insights for SMEs and for municipalities that include the following roadmap:

1. An online course on the basis of the above deliverables
2. Webinars and workshops
3. The development of toolkits
4. A website and online community
5. Open calls for proposals for specific challenges
6. Entrepreneurial missions and co-creation initiatives to provide solutions for these challenges
7. Actual implementation pilots of selected solutions in Mediterranean cities

1. The Smart Cities Ecosystem

The Smart City model is a pathway to incorporating innovation within municipal systems. A core European model for a "smart city" framework, the European Smart Cities Model 3.0, suggests the creation of an innovative urban ecosystem by identifying six dimensions of engagement and development - smart governance, smart economy, smart mobility, smart environment, smart people and smart living. This model is the result of the "Smart cities – Ranking of European medium-sized cities" report by the Centre of Regional Science at the Vienna University of Technology[1]. On the basis of this study, Caragliu et al[2]. suggest that a city can be considered smart "when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance". This concept leads to a new perception of a comprehensive environmental, social and economic ecosystem.

[1] Giffinger, R., Fertner, C. Kramar H., Kalasek R., Pichker-Milanowitc, A., Neirjers. E. et al. (2007) Smart cities – Ranking of European medium-sized cities report, Vienna University of Technology http://www.smart-cities.eu/download/smart_cities_final_report.pdf

[2] Caragliu, A., Del Bo, C. and Nijkamp, A. (2009) Smart cities in Europe. University of Amsterdam, Faculty of Economics, Business Administration and Econometrics, https://www.researchgate.net/publication/46433693_Smart_Cities_in_Europe

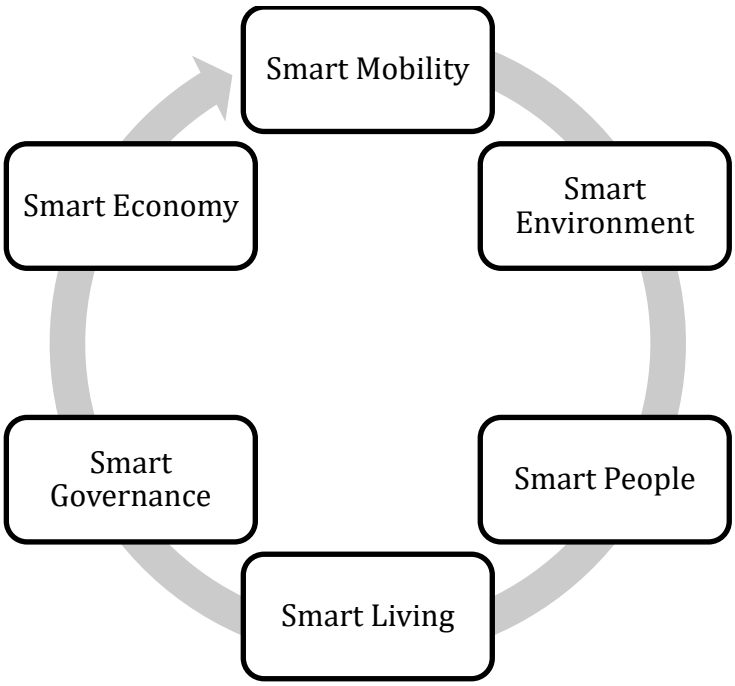

Figure 1: The European Smart Cities Model 3.0 (2014)

The British Standards Organization in the PAS 180 Smart Cities Vocabulary[3], presents a similar approach, while distinguishing between **Enabling concepts** and **Applications**, as can be seen in the following table:

Enabling Concepts – Input Channels	**Applications – Output Channels**
Smart city systems	Environment and Resource management processes
Public and private service delivery models	Finance and economy
Technology and infrastructure	Mobility
Governance	Community
	Education and skills
	Health and well-being

Table 1: BSI, PAS 180 Smart Cities Vocabulary

To enable cities to develop an ecosystem that nurture sustainability and innovation, Zygiaris suggests a 7-layer framework model that demonstrates these interdependencies[4]. The base is the city itself, framed within municipal and statutory borders, the second layer is the **green city layer** – supplying resources, health and quality of the environment, followed by 4 layers of **urban infrastructure and services; communication, data, integration and networks**. **Innovation** is the top layer of the model, reflecting the capacity of the city to support and integrate creativity, trust and collaboration. The model stipulates that successful Smart City models, inherently, require successful mainstreaming of sustainability and sustainable urban development. Urban nature, accessible and sustainable natural resources and climate-neutrality are the basic requirement

[3] BSI, PAS 180 Smart cities Vocabulary, https://www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PAS-180-smart-cities-terminology/

[4] Zygiaris Sotiris (2013), Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems Journal of the Knowledge Economy volume 4, pages 217–231, https://link.springer.com/article/10.1007/s13132-012-0089-4

for residents' quality of life. The International Telecommunication Union (ITU) Focus Group on Smart Sustainable Cities[5] [6] compiled a similar, multi-tier model. In the image below, the tiers are shown top to bottom with the natural environment as tier 1 and soft infrastructure (people, communities, data, software) as tier 4.

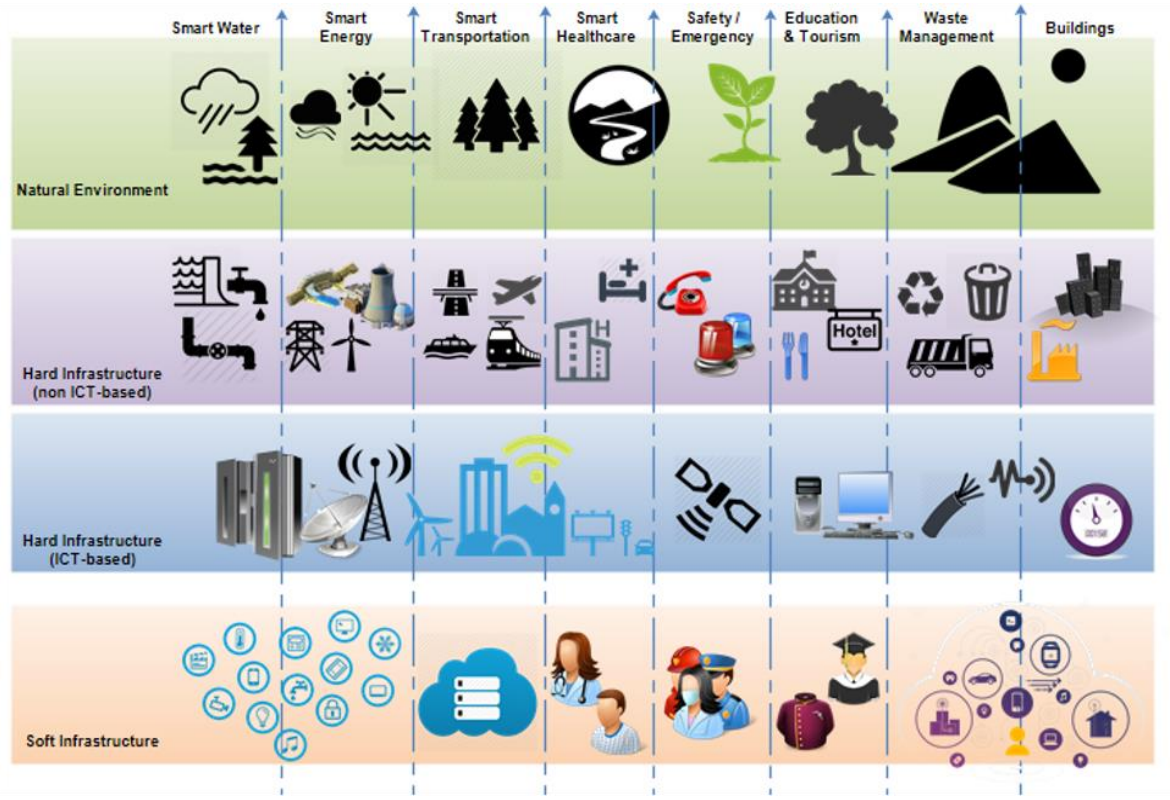

Figure 2: Multi-tier smart sustainable city ICT meta-architecture

All these models show that innovative urban policy depends on integrating environmental and technological components. Urban nature, urban infrastructure, social structure and interaction, human capital and innovative technology are inter-dependent, essential factors and stakeholders of the smart city ecosystem.

[5] International Telecommunications Union (ITU), Technical Specifications on "Setting the framework for an ICT architecture of a smart sustainable city" (SSC-0345), 2015, https://www.itu.int/en/ITU-T/focusgroups/ssc/Documents/website/web-fg-ssc-0345-r5-ssc_architecture.docx

[6] Anthopoulos, L. (2015), Defining smart city architecture for sustainability. In *proceedings of 14th electronic government and 7th electronic participation conference (IFIP2015)* (pp. 140-147)., https://www.researchgate.net/profile/Leonidas_Anthopoulos/publication/277958808_Defining_Smart_City_Architecture_for_Sustainability/links/55e0385908ae6abe6e86dc58/Defining-Smart-City-Architecture-for-Sustainability.pdf

Figure 3: Core components of the Climate Action Plan, based on the framework models of Smart Sustainable Cities (Source: Tel Aviv Municipality)

2. The Smart Cities Market

Local and regional authorities account for about 44% of public procurement spent across Europe, and as much as 83% in Spain and 75% in Italy.[7] Approximately 55% of contracts awarded by such authorities are for services and a smaller number are for works and supplies contracts. Social services, IT supplies and services, environmental and waste management, transport and construction-related services account for a large proportion of local authority contracts.

Many Municipalities are aware of "Smart Cities" trends and offerings. Some cities are highly proactive in pursuing "smart cities" practices on technological, environmental, citizen experience and social/educational/SME acceleration levels while other municipalities are on initial levels of the Smart City Journey.

Some municipalities have dedicated innovation managers and units that proactively seek and embrace innovative initiatives to improve citizen quality of life, services, new digital services for the Public Administration and municipal logistics. Some municipalities publish calls for proposals and initiate events such as hackathons. Cities also participate in European Projects such as the Interreg Europe Pure Cosmos project, that develop highly integrated approaches to cut costs and improve the quality of public administration while

[7] OECD (2018) *Key Data on Local and Regional Governments* in the EU, p 9.

improving the effectiveness of public support for SMEs by reducing regulatory complexity, bureaucracy and uncertainty for the development of SMEs[8] or the Interreg Europe BETTER project[9]

In the EU, an SME is defined as a company with less than 250 employees and either turnover of up to €50 million or a balance sheet total of up to €43 million.

Cities recognize the benefits of diversifying their supply chain with innovative SMEs. A recent EU-level study of SMEs in public procurement found that 65% of contracts valued above the EU threshold and 86% of below-threshold contracts were won by SMEs.10 However, only 33% of the value of above-threshold contracts was won directly by SMEs, with a further 16% estimated via indirect participation.[11]

Rates of SME participation in public tenders vary widely between European countries, with Lithuania, Greece and Malta having the highest rates and Italy, Spain and Portugal the lowest.[12] Interestingly, SMEs appear to be only marginally more successful at winning local or regional authority contracts compared to those awarded by central government, utilities, or other public bodies.[13]

Today, some initiatives to promote SME access to tenders are aimed at domestic or local SMEs, while others are open to SMEs from any country.

Cities may conduct special events, exhibitions, competitions and development hackathons in the search for innovative products and services. These are usually announced on municipal internet sites and promoted on professional magazines and social media. Following municipal newsletters, Facebook, Twitter and similar media channels helps SMEs and entrepreneurs find such opportunities.

The European Commission's Smart Cities Marketplace is a major market-changing undertaking that aims to bring cities, industries, SMEs, investors, researchers and other smart city actors together. It has a community that consists of Action Clusters and Initiatives and it offers services and events for both cities and investors on creating and finding bankable smart city proposals by using an Investor Network and publishing calls for projects. The common aims are to improve citizens' quality of life, increase the competitiveness of European cities and industry as well as to reach European energy and climate targets. You can visit and sign up as a member of the Smart Cities Marketplace at https://smart-cities-marketplace.ec.europa.eu/.

Example:

In Turin, Italy, a contract for the supply of eight innovative electric vehicles for waste collection was awarded in 2017. This followed a market engagement process of market sounding and events in collaboration with a European electric vehicle association (NEV Mobility). The contracting authority assessed potential solutions

[8] Interreg Europe - PURE COSMOS

[9] Interreg Europe - BETTER

[10] European Commission DG for Internal Market, Industry, Entrepreneurship and SMEs (2019) *Analysis of SMEs participation in public procurement and measures to support it – Final report*

[11] Note that figures which contrast the value of public sector contracts won by SMEs with their overall contribution to GDP can be misleading because many SMEs provide goods or services as subcontractors or non-lead partners, but this information is not captured by most tender databases.

[12] *Ibid*, p 20.

[13] *Ibid*, p 50

and developed a technical specification reflecting the emerging market for neighborhood electric vehicles, which are ideal in the historical centres of the towns near Turin to reduce air pollution and noise emissions. The contract is expected to result in financial savings of €8,524 and CO_2 savings of 17 tonnes each year.[14]

Other examples and links:

Genova Smart City Association (Italian) | ERDF OPERATIONAL PROGRAMME - Liguria (En)

Kfar Saba Sustainability and Innovation (Hebrew)

Herzliya Strategy and Innovation (Hebrew)

Tel Aviv Start-up City (Hebrew)

Haifa Smart City (Hebrew)

NGO organizations, events and exhibitions promote urban innovation, smart city practices, SMEs and start-ups

Examples:

Smart Cities Expo World Congress in Barcelona

Israel cities and SMEs participation in Barcelona Smart Cities Expo

Greencities & S-Moving Forum Málaga

Israel Muni Expo (Hebrew)

DLD Tel Aviv Conference

Municipal Readiness and Barriers for SME engagement

The urban challenges and readiness study (A3.1.3) provided findings on the extent that cities feel ready to adopt and implement environmental and climate innovation pathways and on the challenges and barriers encountered in adopting smart initiatives by municipalities.

The participating Mediterranean cities indicated a positive attitude to incorporating innovation as a leverage to sustainability. They seem to be familiar with both sustainability and climate challenges and the concept of innovation ecosystems. Large cities have more experience in incorporating innovative projects in these areas, especially relating to sustainable energy.

The study revealed an interesting discrepancy between issues that need to be addressed and issues that are being addressed. Opportunities for sustainable energy are prevalent and already lucrative, whereas, the hard-core environmental areas, such as nature and waste, are not as attractive. This disparity can create opportunities for both municipalities and innovative SMEs to work together in developing appropriate solutions. The participants noted economic and governance issues that can hinder collaboration but overall, they demonstrated an interest in innovative and sustainable initiatives to address these needs, indicating only few barriers for collaborations with external sources.

[14] SPP Regions Project (2018) – Case Study on CIDIU

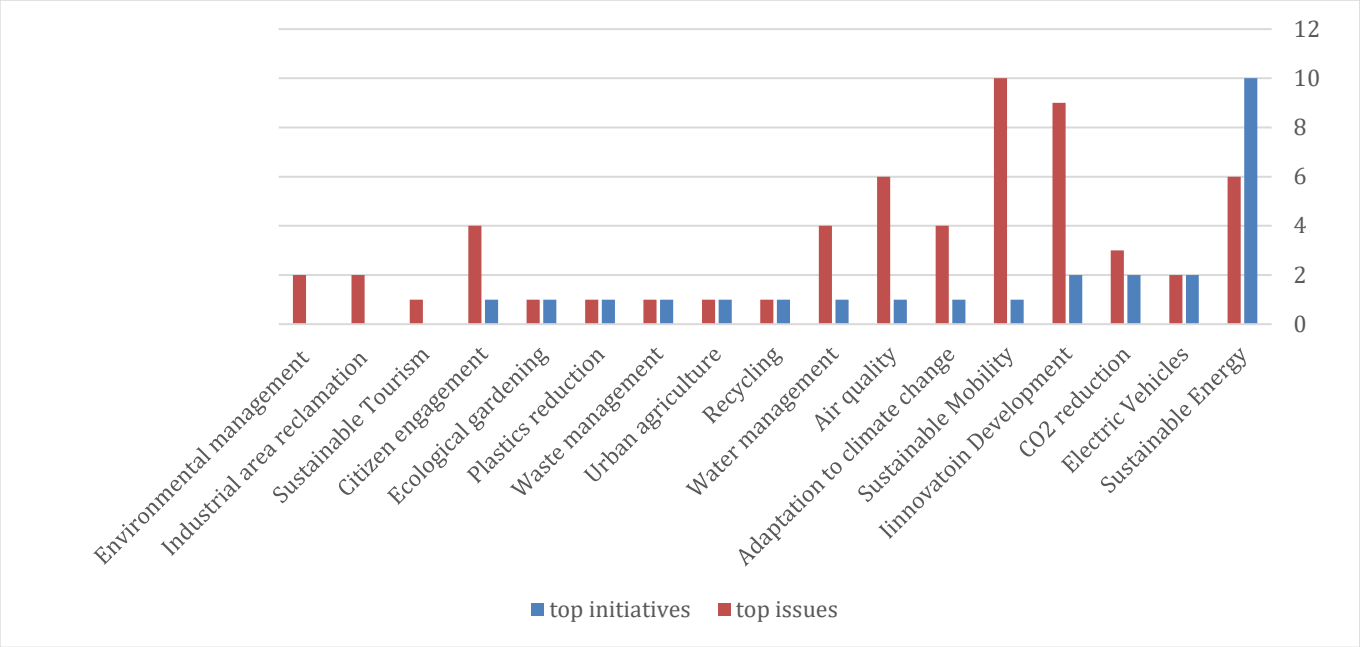

Figure 4: Top areas of environmental issues that **need** to be addressed and issues that are **being** addressed.

Why were the issues in some application areas, such as energy, more frequently addressed that the issues in other application areas such as mobility or air quality? Barriers were encountered that made it very challenging to adopt innovative practices and technologies. The principal barrier, as can be seen in the graph bellow, is financial resources and economic considerations, followed by administrative aspects, such as bureaucracy, administration processes and organizational culture and Technological know-how.

Officials explained that they experience deficiency in communication and understanding when evaluating innovative solutions in comparison to traditional processes. City officials find it challenging to be up-to-date with rapid technological innovation and to be proficient with tech language, and they find that SME managers find it hard to be proficient with the public administration language and administration processes such as tenders and forms, creating a barrier on both sides.

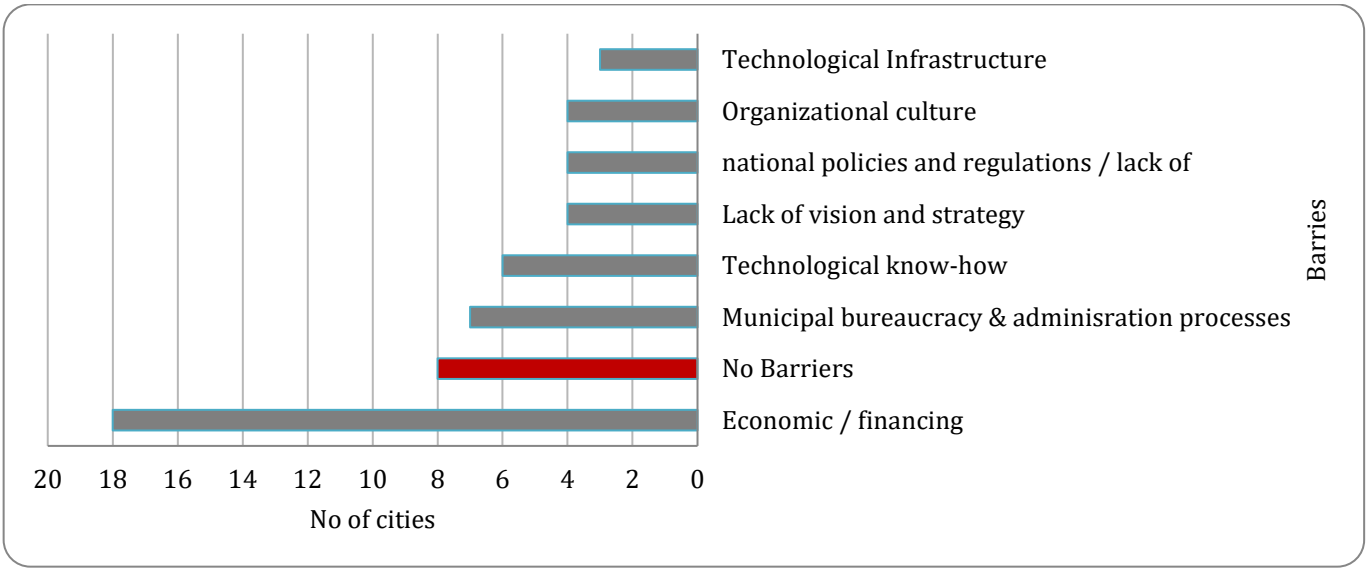

Figure 5: Top barriers to advance smart initiatives

Overall, we found that **the concerns for mainstreaming innovative sustainability are about capacity rather than technology**. Cities have difficulty in creating an innovation-oriented climate because of limited resources, lack of UpToDate knowledge and communication issues.

However, the COVID-19 crisis has shown how quickly local authorities can re-organize, adapt and respond in a most impressive way. When in crisis, barriers fall.

In addition to the initiatives of leading innovative Mediterranean cities such as Barcelona, Genoa, or Tel Aviv Yafo, other participating cities show desire to embrace innovation and use it for their benefit. Large cities are more open to risk taking, show slightly better communications and collaboration between departments and slightly better citizen engagement than smaller cities. Still, small cities show initiatives and readiness to participate in national and regional programs.

More details of these findings are in the urban challenges and readiness study (A3.1.3)

Facilitators for SME access

Existing practices across Europe present solutions for all these barriers. The following sections provide examples for Structural/Legal, Public Authority-Led and SME-Led solutions.

Under EU procurement law, it is illegal to discriminate in favour of SMEs, for example by preventing larger companies from bidding. Likewise, it is not generally possible to favour domestic companies over those from other EU countries, or countries which have a legal right of access to the EU public procurement market.[15] However various measures which support greater SME participation in tenders have been successfully adopted by local authorities.

Division of contracts into lots

The division of large contracts into smaller lots facilitates SME participation. Article 46 of Directive 2014/24/EU encourages this practice by requiring contracting authorities to explain decisions not to divide a contract into lots, and national legislation can mandate division into lots.[16] Lots may be divided according to subject-matter (e.g. separating different activities to be performed in a works contract), geography (e.g. by districts of a city or region), value (different contractors carry out IT services depending on value band) or other criteria. The contracting authority indicates in the notice whether bids can be submitted for one or multiple lots.

As an example, the city of Valladolid, Spain adopted a Municipal Plan to support the participation of SMEs in public procurement. Valladolid has made the division of contracts into small lots a general practice – one €8 million contract was divided into 18 lots. Although this can involve more administrative work, together with other measures it has led to 75% of city contracts being awarded to SMEs, significantly higher than the Spanish and EU averages. A recent large-scale EU study suggests that the division of contracts into 10-19 lots increased SME participation from 62% to 65%.

Tender award criteria

Award criteria which focus on quality, environmental performance, innovation or other non-cost elements support SME success in tenders because larger companies often have a price advantage in terms of economies of scale, and may offer large discounts to secure public sector contracts. Qualitative criteria also force

[15] Such legal rights of access exist under the WTO Government Procurement Agreement, as well as under bilateral trade agreements signed by the EU and partner countries. Further information is available here.

[16] For example, Germany's 2016 Procurement Regulation for Public Works (VOB/A) includes a requirement to divide contracts into lots, with exceptions for economic or technical reasons.

contracting authorities to evaluate products or services on their merits, rather than simply relying on a company's reputation, previous experience, resources etc. The 2014 Procurement Directives require all contracts to be awarded on the basis of 'most economically advantageous tender' (MEAT), but it is only where the 'best price-quality ratio' (BPQR) approach is taken that non-cost criteria are included. The use of qualitative criteria varies substantially between countries, regions and individual contracting authorities and is sometimes viewed with suspicion in areas with high levels of corruption or strong constraints on public spending.

Limits on eligibility requirements

Restrictions on eligibility requirements ensure that the criteria used to select bidders are proportionate and do not exclude SMEs unfairly. The 2014 Procurement Directives limit turnover requirements which may be applied to two times the value of the contract, and also limit the period over which bidders can be asked to provide details of previous contracts.[17] Bidders may rely on the capacity of other entities to meet eligibility requirements, for example a partner, subcontractor or parent company.[18] Aside from these legal limits, best practice in SME-friendly procurement generally involves streamlining eligibility requirements as much as possible. This means ensuring that any rules regarding human or technical resources, qualifications or certifications and insurances are strictly in line with the needs of the contract.

Support programmes

A wide range of support programmes are available to SMEs at European, national and local/regional level. Many of these include financial and technical support to help access public procurement markets. In addition to ongoing schemes, SMEs should be aware of the potential for R&D support in specific sectors via pre-commercial procurement (see box on innovation procurement). More limited forms of support such as information or networking sessions targeted specifically at SMEs wishing to access public procurement are also used in many European localities.

More details and examples of these channels are in the Current Procurement Trends Guide (A3.1.2)

Piloting and Forward-Commitment Procurement

Piloting and Forward Commitment Procurement (FCP) encourage innovation and SME participation by de-risking procurement. Piloting involves a small-scale test of a new product, service or work – e.g. developing a beta version of a public health app or a prototype of a new bus shelter which is tested by users. Pilot projects may be procured on a standalone basis or as a phase within a larger process such as innovation partnership. In Piloting, the contracting authority generally holds a separate competition for procurement on a commercial scale. FCP involves a public authority defining a need for solutions not currently available and defining an allocated budget to purchase a solution - should it match the pre-defined criteria. If a developed product or service meets the required performance and price, the public authority commits to purchase it. FCP encompasses techniques such as the use of market engagement and encouragement of networking/consortium formation by bidders.

Piloting is widely used for new or complex public projects, and their design and implementation varies widely. An example of piloting as part of an innovation partnership to address urban flooding is the town of Frederiksberg, Denmark.

[17] Articles 58(3) and Annex XII of Directive 2014/24/EU

[18] Article 63 of Directive 2014/24/EU

An example of FCP is the development of a sustainable bed-washing solution for the Erasmus Medical Centre in Rotterdam, the Netherlands.

Registration

To be considered as municipal suppliers, SMEs often need to register to a "suppliers pool" and to have a supplier account set up during the procurement process or in advance. The registration to the "suppliers pool" is important for participation in small-scale tenders, where only registered suppliers can participate, and to receive updates of new tenders or RFIs.

This process is different across different territories. In Israel registration is per municipality. Suppliers need to register with each municipality for which they plan to provide services and products. In Italy, the reference legislation for negotiated procedures is on a national basis. Not at a municipal level. There is no "registration" as a supplier. The designated supplier receives a direct award or follows a negotiated procedure based on the contract code, which sets out specific references to the specific requirements for a supplier. A company wishing to take part in a negotiated procedure is required to self-certify specific requirements. In Spain, SMEs need to be registered at *Plataforma de Contratación del Sector Público*.

More details and examples of these channels are in the Current Procurement Trends Guide (A3.1.2)

3. The Advent of Innovative Procurement

Smart Innovation is the adoption and implementation of innovative products, technologies or services that support urban resilience, sustainability, social, economic and environmental well-being. Areas where Smart Innovation is of high benefit to cities and residents include mobility, energy, water, food, waste management, ecology, urban nature, climate, circular economy, sharing economy, citizen engagement and education.

Public procurement of innovation (PPI) became a very prominent topic across Europe. The 2014 EU Procurement Directives allow innovative characteristics to be taken into account in award criteria and include procedures designed to procure goods or services not currently available on the market.

For the procurement of R&D services and prototypes, pre-commercial procurement (PCP) can be applied. If a public authority wishes to purchase the outcome of R&D, the innovation partnership procedure allows for the award of a commercial contract at the end of the R&D/testing cycle. One or more partners may be involved in developing and testing products to meet the needs defined by the public authority. The Horizon 2020 programme has been instrumental in supporting many applications of PCP/PPI, including in the healthcare, computing, transport and environmental management sectors.

4. The Opportunities offered by Green Public Procurement

Many municipalities recognize the power of procurement of environmentally friendly and sustainable goods, services and technologies, to alleviate environmental, residential and public health issues that increasingly affect cities today. By purchasing goods, services and works with a reduced environmental impact, public

authorities can make an important contribution towards local, regional, national and international sustainability goals.

Green Public Procurement (GPP) includes life-cycle costing, specification of sustainable production processes, and use of environmental award criteria to help contracting authorities identify environmentally preferable bids. The concept of **Sustainable Public Procurement (SPP)** includes both environmental and social criteria in purchasing decisions.

Short-term price considerations overlook the importance and value of the full product life cycle (Life-Cycle cost). The real cost of a product is not just the direct purchasing price, but includes all incurred costs during its life cycle, including transportation, use, maintenance, and waste disposal as well as external environmental, health, social and economic costs. Life cycle costs often highlight the advantage of green products which are usually more resource efficient (thus costing less during use) or do not contain hazardous materials (thus costing less to dispose of).

A product's life-cycle perspective emphasizes the aggregate costs and long-term benefits of using green, sustainable products. Yet, many purchasing organizations still take decisions mainly based on purchasing price. As purchase price, energy and maintenance costs may be paid by different departments within a single authority (known as the problem of split incentives), establishing life-cycle costs within procurement procedures will likely require intra- or even inter-authority cooperation.

GPP is a major driver for innovation, providing industry with real incentives for developing green products and services. This is particularly true in sectors where public purchasers represent a large share of the market (e.g. construction, health services, or transport). GPP can also provide financial savings for public authorities – especially when considering the full life-cycle costs of a contract and not just the purchase price. The result is a win-win positive cycle for both public authorities and for SMEs.

In the survey we conducted with SMEs (A3.2.1), 81% of all SMEs said that they take into consideration green and environmentally friendly policies and 54% said that they undertake Corporate Social Responsibility actions. Yet, in a survey of SME innovation centers, technology consultancies and experts (A3.2.3), only 25% of them estimated that most SMEs take into consideration green and environmentally friendly policies when operating and undertake Corporate Social Responsibility actions. This gap clearly calls for more communications and learning initiatives. It was also commented that it is essential to articulate mechanisms so that SMEs that are committed to sustainability have benefits over those that do not.

Participants in the survey of SME innovation centers, technology consultancies and experts (A3.2.3) also highly agreed (80%) that offering products that create less waste can be useful for SMEs to penetrate the municipal market. Working towards other GPP goals such as lower overall product lifecycle cost and "products as a service" can also be door openers for SMEs.

European DIRECTIVE 2014/24/EU[19] enables public authorities to take environmental considerations into account (note: for entities operating in the water, energy, transport and postal services sectors directive Directive 2014/25/EU is of more relevance). For SMEs, knowing these procedures is useful for their work with municipalities.

[19] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02014L0024-20200101

The European Commission Green Public Procurement (GPP) guidance provides an overview of the legal framework for public procurement, with criteria and guides for implementation of GPP[20], which include environmental and social[21] considerations. In addition, **Pre-commercial procurement[22]** can be used to advance green innovative procurement by having public authorities and SMEs work together to develop technologies, products or processes to meet the environmental objectives identified by a public authority[23].

Under the 2014 procurement directives, all contracts must be awarded on the basis of Most Economically Advantageous Tender (MEAT). Financial evaluation may be based on life cycle costs (see below) of the solution, and not just the purchasing price. Environmental criteria may be viewed as determining the value of the proposal if they are linked to the subject matter of the contract, do not restrict the choices of the contracting authority, enable effective competition, are expressly mentioned in the contract notice and tender documents, together with their weightings and any applicable sub-criteria, and (in Europe) comply with the Treaty principles.

Within the EU Circular Economy Action Plan, the commission will propose minimum mandatory green public procurement criteria and targets in sectoral legislation and phase in compulsory reporting to monitor the uptake of Green Public Procurement. Furthermore, the Commission will support capacity building and encourage public buyers to take part in a "Public Buyers for Climate and Environment" initiative[24], which will facilitate exchanges among buyers committed to green public procurement implementation. Lastly, the future Strategy for a Sustainable Built Environment, which is part of the action plan, will integrate life cycle assessment in public procurement.

The European Commission prepared environmental procurement criteria for numerous product and service groups which can be directly inserted into tender documents[25]. These EU GPP criteria are an excellent source of knowledge and reference for any SME that provides products and services that include anything from catering services to computer hardware and office building design, construction and management. Some Member States have specific rules creating mandatory green public procurement standards for particular sectors or types of contracts. National procurers should ensure they are up to date with national requirements.

A detailed list of EU policies, strategies and legislation related to green public procurement can be found in the Annex to the "Buying Green" handbook[26]. While these guidelines are intended for policy makers and procurers, SMEs will also find them useful.

A collection of over 100 of these examples can be found at the EU GPP website - both ongoing projects[27] and completed projects[28].

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[20] Commission guidance - GPP - Environment

[21] DG Employment, Social Affairs and Inclusion website

[22] Pre-Commercial Procurement (PCP) website

[23] 52007DC0799 - EN - EUR-Lex

[24][] Status unclear at the time of writing.

[25] EU GPP criteria

[26] A handbook on green public procurement 3rd Edition

[27] GPP ongoing projects - Environment

[28] GPP completed projects – Environment – European Commission

Figure 6: The "Buying Green" handbook

ICLEI provides a range of guidance and resources for implementing Sustainable Public Procurement, which include purchasing criteria for six product groups (buses, cleaning products & services, electricity, food & catering services, IT products, building construction & renovation) in Procura+, a network of more than 40 European public authorities and regions that connect, exchange and act on sustainable and innovation procurement.

Resources in specific countries:

Italy:

- Italy green public procurement (Italian)
- Information on the National green public procurement Action-Plan – in Italian and English
- An overview of good examples of environmental management criteria in green public procurement in Italy is available in the presentation "Overview of good examples of using EMAS or environmental management criteria in GPP Experiences in Italy"[29] by Nadia Galluzzo for Interreg Europe's ENHANCE project.
- The Ministerial Decree 2017 of the Ministry of Infrastructure and Transport[30] entrusted metropolitan cities with the definition of Urban Plans for sustainable mobility. La Brianza, with 870 thousand inhabitants and one of the highest land consumption and population density in Italy and Monza, ranked third place among the most polluted provincial capitals in Italy and in 98th place out of 104 provincial capitals for overall

[29] https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1520607446.pdf

[30] Identification of the guidelines for urban sustainable mobility plans, pursuant to article 3, paragraph 7, of Legislative Decree no. 257

quality, launched the "Piano Urbano della Mobilità Sostenibile di Monza e della Brianza" (PUMS) program to fight "environmental decay" by focusing on the mobility system[31].

Spain:

- green public procurement Manual (Spanish. Ayuntamiento de Madrid – City of Madrid)
- Information on green public procurement (Catalan. Generalitat de Catalunya – Government of Catalonia)
- City + sustainable: green public procurement – in Catalan, Spanish and English (l'Ajuntament de Barcelona-City of Barcelona)
- green public procurement website Compra pública sostenible (Catalan)
- green public procurement in the Basque Country in Euskadi, Spanish and in English (Ihobe – Basque Agency for Environmental Management).
- Basque country green public procurement manual (Spanish)

Israel

- The Ministry of Environmental Protection has published green criteria for several domains[32]
- "Forum 15" organization of large, independent municipalities, adopted directives for environmental and sustainability management in urban tenders[33] [34] which it proactively encourages municipalities to adopt. While there is a preference for environmentally friendly and sustainable services, they are not obligatory. These directives encourage changing perspectives of "Green" procurement from looking at products that have reduced environmental impact (such as recycled paper) to a full product life cycle approach. In 2014, Forum 15 published an outline for adopting an environmental and sustainability approach in all urban tenders, with concrete steps and tools for municipalities[35].
- The Local Government Economic Services company that provides services to many municipalities and reviews tenders for environmental impact before publishing[36] adopted the ISO-14001 environmental management standard[37] and communicates a preference for green procurement.

5. Knowledge and Learning Needs

The SME survey conducted for this project and summarized in report 3.2.1 "Identification of the training and capacitation needs of technological and Innovative SMEs: Analytical Report", and the survey of SME innovation centers, technology consultancies and experts (A3.2.3), indicated critical needs for knowledge of municipal

[31] PUMS – Piano Urbano della Mobilità sostenibile di Monza e della Brianza

[32] Adding Environmental criteria to Tenders (Hebrew)

[33] Outline for environmental conduct and maintained in municipal tenders (HE)

[34] Winning recipes from the field for the application of urban sustainability (HE)

[35] Forum 15 - An outline of environmental management and sustainability in urban tenders (Hebrew)

[36] Forum 15 -- Environment and Sustainability Services Page 5 (Hebrew)

[37] ISO 14000 FAMILY ENVIRONMENTAL MANAGEMENT (EN)

processes, opportunities and "smart Cities" know-how, municipalities operational processes and procurement procedures.

- Knowledge related to procurement and tendering procedures and to legal regulations that can enhance the collaboration between cities and SMEs and the success rate of SMEs in tenders. SMEs also require training in processes taken between municipal departments, especially those related to innovation, implementation and finance when announcing a bid.
- Learning the jargon used by civil services to better communicate with city officials and reply to tenders
- Awareness to and knowledge of green and environmentally friendly policies, Green Procurement (GPP) practices, circular economy and "product as a service" concepts and opportunities
- Addressing issues related to the scalability of the infrastructures and the technological resources required for implementing big projects within the framework of cities and municipalities
- Increased knowledge of innovative technologies such as Artificial Intelligence, management of big data, blockchain, Virtual Reality, Fintech and mobile technologies
- Improve Technology communication between local governments and SMEs
- Access of municipalities' staff to training on local and international technology trends

the Smart City Online Course for SMEs, developed within the framework of the SME4SMARTCITIES project[38] and the co-creation coaching provided by the project for SMEs that participate in the open calls for urban challenges, have addressed these knowledge and learning needs.

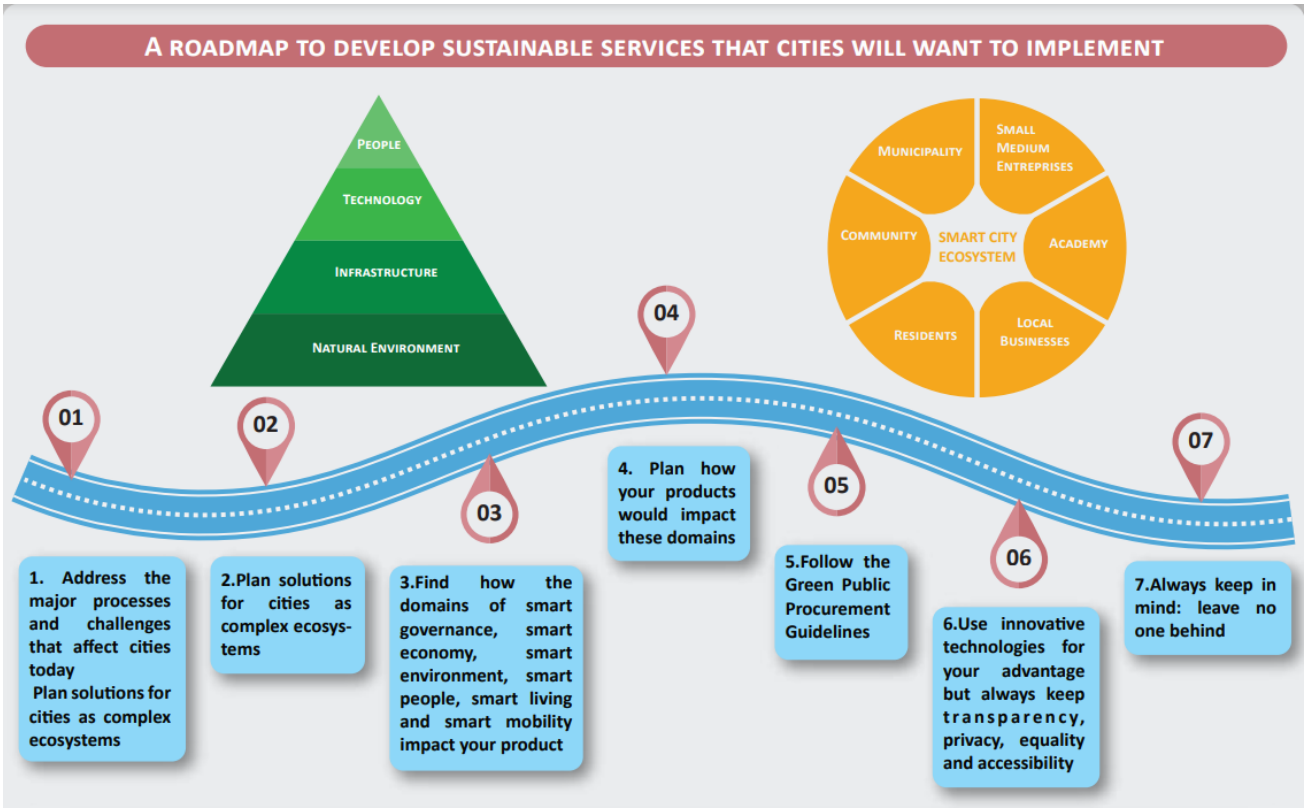

Figure 6: A Roadmap for developing sustainable services for cities – Infographics from the SME4SMARTCITIES' Smart City Online Course for SMEs

[38] SME4SMARTCITIES Smart City Online Training Programme https://sme4smartcities.eu/sme-online-course/

6. Co-creation, Collaboration and Industry Clusters

In the survey of SME innovation centers, technology consultancies and experts (A3.2.3) 75% of participants agreed that if SMEs create clusters or bundles of offerings together it will provide them with competitive edge.

Collaboration between solution providers to create clusters of innovative, sustainable solutions to the needs that cities communicate, can make it easier to cities to find and implement solutions. Instead of competing and creating a sense of overwhelming confusion, they can suggest an integrated solution. As an example, if one SME developed a technology for the rapid planting and easy care of trees in paved areas and another SME developed a low lifecycle cost technology for fabricating street benches from recycles materials, together they can offer an integrated solution of cool sitting areas in urban spaces. The SMEs can be from various Mediterranean territories, creating a cross-border collaboration that offers appealing solutions to improve well being that cities can more easily adapt and implement.

7. Recommendations for SMEs

The following steps should be taken to increase SME participation and success in local authority procurement:

1. **Invest in the entire procurement cycle**

   Just as local authorities are encouraged to treat procurement as a strategic function, engagement with local authorities should begin at the earliest stage (even prior to a defined procurement need being identified), and continue through any market engagement exercise, the post-tender period (asking for a debriefing if unsuccessful) and the contract delivery stage (if successful). Decide on the most appropriate tone and technique for each stage, keeping in mind that traditional marketing techniques are often not appreciated by procurement officers.

2. **Focus on platforms and procedures which are SME-friendly**

   Tendering for public contracts is time and resource-intensive. To focus efforts on contract opportunities for which they have the greatest chance of success, SMEs should Identify one or several platforms on which to establish a supplier profile and search for upcoming tenders. Keep an eye out for pre-procurement or market sounding activities and respond quickly and comprehensively to any requests for information. Look for notices which explicitly mention innovation, lots, best price-quality ratio or piloting as these may indicate the buyer will be particularly receptive to SME bids.

3. **Specialize and/or partner with others**

   Develop a specialization strategy which fits in with the needs of public authorities in the locality or region you wish to target. Rather than trying to establish competence across a broad range of activities, focus on those where your business can stand out from the crowd and offer a service tailored to public sector needs. Keep an open mind regarding subcontracting opportunities or the formation of partnerships, as these can offer an in-road to public contracts which would otherwise be inaccessible.

8. Conclusions

Cities face growing environmental, economic and social challenges driven by large-scale processes such as growing urbanization and Climate change. The Mediterranean areas is even more affected by rapid urbanization and climate change than other parts of the world. These challenges require cities to find and implement new urban solutions.

The 34 cities that participated in our study show openness to adopt and implement new innovative solutions by emerging small and medium sized enterprises. This can have a major role in improving urban environments, infrastructures and wellbeing. Yet, they also face challenges and barriers while working to achieve better sustainability and urban resilience. Cities have difficulty in creating an innovation-oriented climate because of limited resources, knowledge and communication issues.

Municipalities show different levels of readiness to embrace solutions and new opportunities but overall, they demonstrated an interest in innovative and sustainable initiatives to address these needs. Large cities are more open to risk taking, show slightly better communications and collaboration between departments and slightly better citizen engagement than smaller cities. Still, small cities also show initiatives and readiness to participate in national and regional programs.

Opportunities for sustainable energy are prevalent and already lucrative, whereas other applicative areas, such as mobility, natural environment and waste, still have a gap between needs and actual solutions. This disparity can create opportunities for both municipalities and innovative SMEs to work together in developing appropriate solutions. Current channels that range from green procurement directives to local and regional initiatives and the hosting opportunities that many cities offer to SMEs such as innovation centers, accelerators, hackathons and piloting opportunities that open the door to SMEs.

The objectives of the SME4SMARTCITIES project are to support the development of new efficient, smart and sustainable products and services to resolve urban challenges faced by Mediterranean cities, to support the entry of Mediterranean technological and innovative SMEs in the market of smart cities, to create new solutions under a demand-driven approach and to improve their capability to create new knowledge resulting from cross-border cooperative processes. The studies and resources that are referred to in this review and in the following list of references, show the variety of channels and opportunities for SMEs to fully participate in the market of smart city solutions.

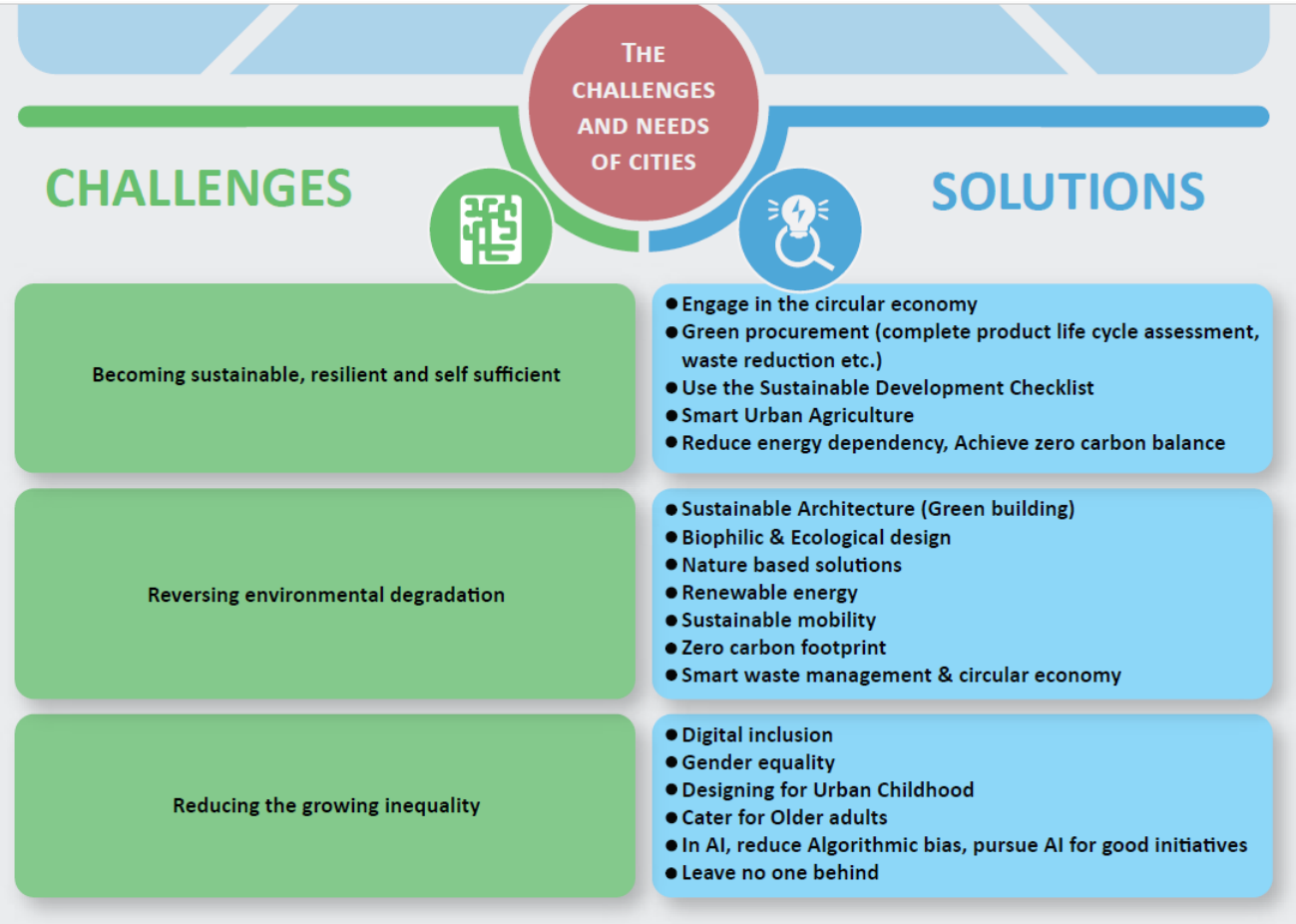

Figure 7: Major Challenges and directions for solutions to make cities smart and sustainable – Infographics from the SME4SMARTCITIES' Smart City Online Course for SMEs

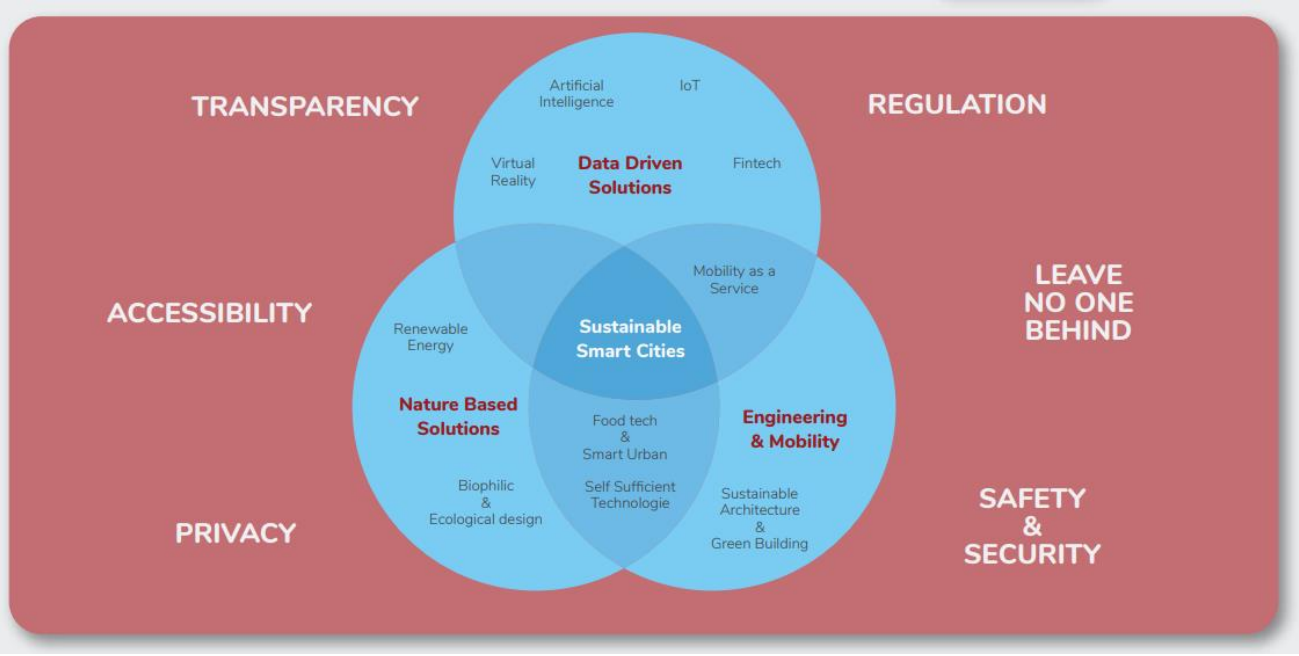

Figure 8: An integrative approach for developing sustainable services for cities – Infographics from the SME4SMARTCITIES' Smart City Online Course for SMEs

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