ANNEX I. CHALLENGE DESCRIPTION

The following specifications of the unmet need are purely indicative. These specifications may evolve as the state of the development in each of the fields is updated.

THE PROJECT "VALENCIA, A CLIMATE-NEUTRAL CITY IN 2030; PPI STRATEGIC LINE 3: URBAN PLANNING AND SUSTAINABLE HABITAT", FOCUSES ON:

THE IDENTIFICATION OF INNOVATIVE TECHNOLOGIES AND SOLUTIONS THAT CONTRIBUTE TO THE ADAPTATION AND RENOVATION OF PUBLIC AND PRIVATE INFRASTRUCTURES, EQUIPMENT, BUILDINGS AND HOMES, PUBLIC AND PRIVATE, IN ORDER TO OPTIMISE THEIR ENERGY EFFICIENCY, MINIMISING THE CITY'S ENERGY DEMAND AND EMISSIONS IN A SCENARIO OF CLIMATE NEUTRALITY.

1. BACKGROUND

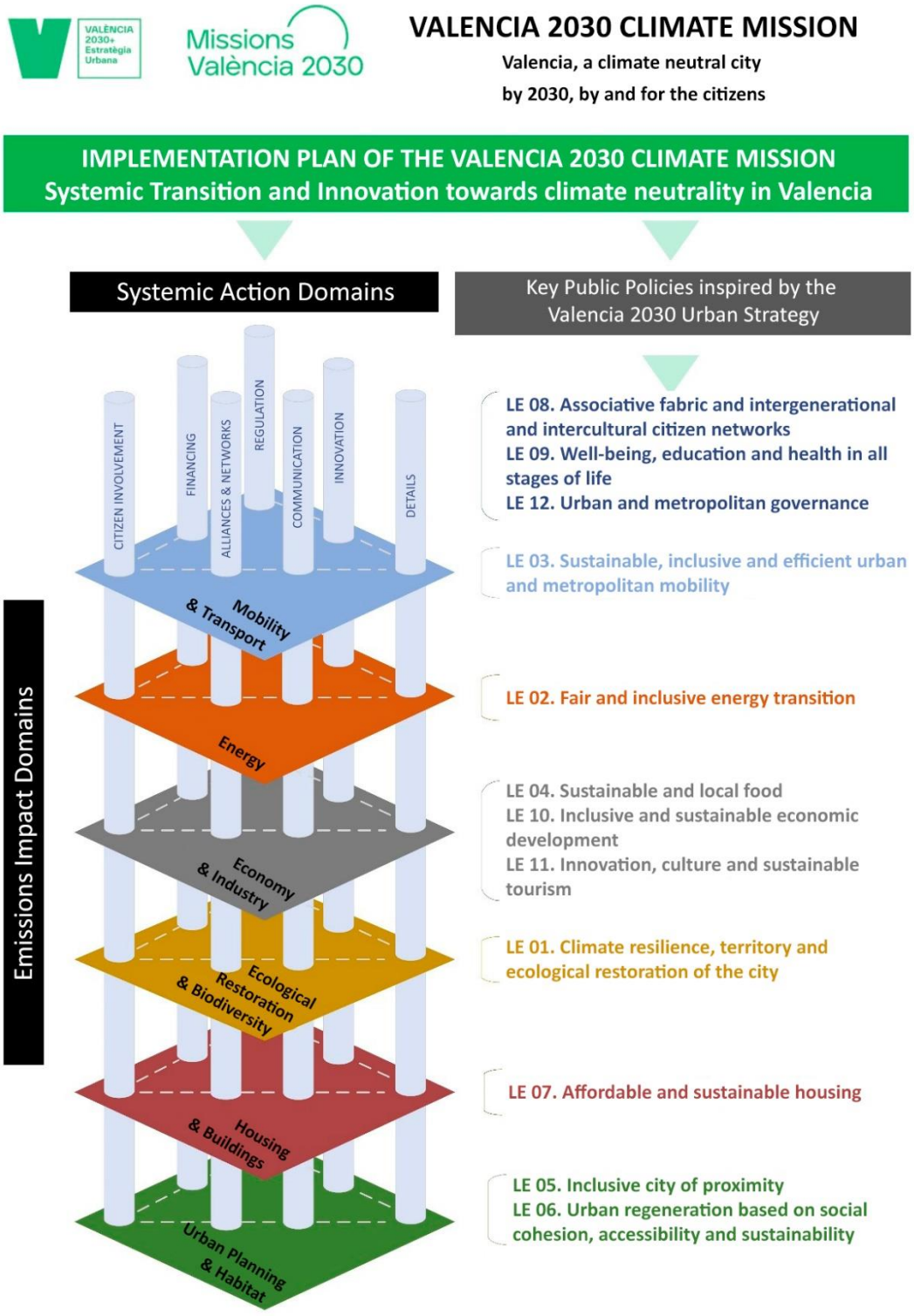
The Valencia City Council has proposed a framework for strategic reflection with a city planning vision for the year 2030. This long-term vision pursues a transition towards a more sustainable, healthier, more shared, and more prosperous and entrepreneurial city, and involves identifying and implementing solutions for the great urban challenges.

To this end, and in collaboration with numerous entities within the Valencian science, technology and innovation system, in 2020 it launched the Missions Valencia 2030 research and innovation governance model. This model places people, the relationships between them and their interactions with the urban environment and the environment that surrounds them at the centre, and proposes the development of innovation oriented towards missions that improve people's lives, fundamentally serving their needs and in line with their expectations. In short, innovation with a tri-fold purpose and impact: economic, social and environmental.

With this humanistic vision, the Valencia City Council is developing its Valencia 2030 Urban Strategy where it merges its public policies inspired within the framework of the 2030 Agenda and the sustainable development goals with the innovation missions launched from Missions Valencia 2030. Thus, the Valencia Urban Strategy is structured by uniting the 2030 Agenda and innovation, in order to solve the greatest complexities that society and cities face. This strategy is based on 6 Visions aimed at achieving a Healthier, more Sustainable, more Shared, more Prosperous and Entrepreneurial, more Creative and more Mediterranean city for its citizens, while following a roadmap to generate and improve capacities in its Local Public Administration in order to ensure its role of support and key instrument for the realisation of the desired city model.

Within this strategic context, in 2021, with a broad social and political consensus, the city of Valencia approved its first innovation mission: the Valencia 2030 Climate Mission, which aspires to make Valencia a climate-neutral city by 2030

within the context of the European mission to reach 100 climate neutral and smart cities by the end of the decade. The following image identifies the domains with the greatest impact on emissions and the domains of systemic action necessary for the success of the Valencia 2030 Climate Mission.



This exercise is enabling the development of an action plan adapted to the specific urban, climatic, social and economic characteristics of the City of Valencia under the vision of progress led by its City Council. A plan that proposes responses adapted to large-scale challenges, many of which are global in nature, and which are progressively being included in the urban development agendas of major cities around the world.

But adequately addressing these challenges is not an easy task or an immediate solution. It will require a very large and prolonged effort to transform the city model, both at the public and private levels and on the social level, and it will not be possible to face them by mobilising only the solutions and technologies available today. Making it happen, and on time, will require the massive development and deployment of innovative technologies and solutions, many of which are still in the pipeline.

The Valencia City Council is aware of this reality, of the magnitude of the challenges that the city inescapably has to face, of the need to do so according to a social agenda that enables it to achieve the minimum negative impact on its entire population, mainly among the most disadvantaged, and of the importance that technological innovation will have throughout the process.

For this reason, it has decided to resort to Public Procurement of Innovation (PPI) in order to stimulate the development and initial deployment of new adapted solutions and technologies within the city that support this transformation effort. Innovative technologies and solutions that can be subsequently scaled up in the Valencia area, both through public and private initiatives, and that can also be applied in other urban centres with similar characteristics, with the consequent pull effect of this initiative.

This recourse to Public Procurement of Innovation is not conducted with a narrow vision, addressing only one or several specific challenges. It is proposed in a comprehensive format, in order to obtain a broad vision of the potential solutions to support this necessary urban transformation, and then invest progressively, depending on the availability of resources, in those that have a greater potential to have an impact on the city. The goal of this is also to have a justified Strategic Plan for the PPI, including a “pipeline” of projects consistent with the municipal strategy, which guide a consistent activity of raising complementary funds that multiply the action capacity of the Valencia City Council.

To this end, and thanks to the involvement of a large group of representatives from public and private entities, and from Valencian civil society, the Valencia City Council has co-created and published its Valencia 2030 Early Demand Map (EDM), which identifies a total of 54 challenges and 305 public needs not met efficiently by the market and that will probably require the development of new products and services to meet them, and thus maximise the generation of public value.

A prioritisation of these 54 challenges and these 305 needs has been carried out with an eye on the Valencia 2030 Climate Mission, and the result has subsequently been reviewed and improved with the support of researchers and

technical and legal experts. This prioritisation has operated on the Sustainable Vision as the backbone of the entire PPI strategy, and has applied three assessment factors: the City Council's ability to act according to its competence framework, the potential to create value from technological innovation, and its specific weight in the city's transformation and decarbonisation goals.

As a consequence, a Strategic PPI Plan has been developed, which is structured around 8 lines of work:

PPI strategic line 1: Sustainable mobility

Transformation of the city's internal mobility and logistics model towards a scenario of minimum energy consumption and climate neutrality.

PPI strategic line 2: Energy model

Transformation of the city's Energy Model towards a scenario of production and consumption of energy from renewable sources within the context of a fair and inclusive transition towards climate neutrality.

PPI strategic line 3: Urban planning and sustainable habitat

Adaptation and renovation of infrastructures, equipment, buildings and homes, public and private, in order to optimise their energy efficiency, minimising the city's energy demand and emissions in a scenario of climate neutrality.

PPI strategic line 4: Circular and sustainable Valencian economy

Minimisation of city waste; paradigm shift in the management of solid and liquid waste towards a scenario of zero waste and climate neutrality. Green transformation of the economic and cultural activities of the city.

PPI strategic line 5: Ecological restoration

Maximising the ecological restoration of public and private spaces within the city and the use of sustainable solutions based on nature, in support of the Valencia 2030 Climate Mission.

PPI strategic line 6: Resilience and adaptation

Adaptation of the city to deal effectively with the adverse effects that may arise from Climate Change. Optimising its resilience capacity in a climate neutrality scenario.

PPI strategic line 7: Smart governance

> Strengthening of the Valencia City Council with those public capacities necessary to be more efficient and to monitor and intelligently govern the systemic transformation of the municipality towards climate neutrality, and towards a city model adapted and resilient to climate change.

PPI strategic line 8: Education and social involvement

> Maximisation of education, awareness, participation and involvement of citizens, public and private entities, and civil society in achieving the systemic transformation of the City of Valencia in accordance with the goals of the Valencia 2030 Climate Mission.

In Article 115 of Law 9/2017 of 08 November, regarding Public Sector Contracts, which transposes the Directives of the European Parliament and of the Council 2014/23/EU and 2014/24/EU, of 26 February 2014, Articles 40 and 41 –hereinafter referred to as the LCSP–, it is established that the contracting authorities may carry out preliminary market consultations in order to prepare the possible procurement and inform the economic operators about their plans and the requirements that will need to be met in order to take part in the eventual award procedure, as well as the rest of the aspects that must be taken into account in a process of this nature.

In this sense, the Decree of 03 November 2016 of the Delegate of the Government Department of Economy and Finance, approving Instruction 4/2016 regarding the processing criteria for conducting preliminary consultations of the market within the scope of municipal public procurement, the goal of which is to establish common and general processing criteria that must be taken into account by the contracting authorities for conducting preliminary market consultations, is also key.

This document addresses PPI Strategic Line 3: Urban Planning and Sustainable Habitat: Adaptation and renovation of infrastructures, equipment, buildings and homes, public and private, in order to optimise their energy efficiency, minimising the city's energy demand and emissions in a scenario of climate neutrality.

2. STATE OF THE DEVELOPMENT

Energy consumption related to the needs of lighting, hot water service, operation of electrical appliances, and generation of cold and heat in homes and in public and private service buildings and facilities, represents 35% of global energy consumption. This figure rises to 50% if the production of construction materials and construction processes are taken into account, contemplating their full life cycle.

These consumptions are conditioned by the urban model of the city, and by the materials, devices and processes used in the sector. For this reason, the rethinking of urban planning models and the promotion of energy optimisation in infrastructures and buildings is one of the Valencia City Council's priority

objectives. And this, both in new constructions and urban development projects, as well as in rehabilitation and renovation interventions, includes taking into account their processes and materials.

To this end, in addition to the progressive deployment of advanced technological solutions available on the market, the drive to develop and adopt new technologies and management models will be decisive.

Among the former are technologies intended for lighting, refrigeration systems and household appliances. In the field of lighting, there has been remarkable development with LED technology. Similarly, in improving the energy efficiency of household appliances. Air conditioning systems, however, exhibit a significant margin for improvement. This margin for improvement is much greater within the scope of heat generation and consumption and in the thermal behaviour of enclosed spaces.

Regarding thermal applications, the use of heat pumps and other renewable systems for heating and cooling has increased significantly. However, heating equipment based on the use of fossil fuels and conventional electric heaters are the most widespread and still represent a very high percentage of sales for new installations. In order to advance in the decarbonisation of the building sector, it is urgently necessary to reduce the proportion of conventional heating equipment.

Pump technology also has a significant margin for improvement. Among other areas, the operation of heat exchange solutions based on shallow geothermal energy and water resources has a long way to go, which achieve higher levels of efficiency than traditional air conditioning equipment and significantly reducing energy consumption.

These solutions take on a particular interest when they are directed at user communities and are applied within the context of the deployment of district networks and micro-grids, including linked to the Energy Community concept. This combination constitutes an optimal techno-legal environment for the adoption of measures with a great social and energy impact, by allowing for the orderly transition of large urban areas, optimal management and the use of economies of scale.

On the other hand, technologies aimed at improving the efficiency of the building envelope, including thermal insulation, façades, walls, roofs and windows, play an essential role in the energy performance of buildings. There has been a substantial advance in this field, in the theoretical design of smart and active envelopes. However, their transfer to the market has so far been very low.

The development of more efficient insulating materials is crucial to reduce the heating demand of buildings. Recent research has focused mainly on the development of advanced components based on aerogels, as well as vacuum and gas-insulated panels. Super-insulating materials can increase insulation fivefold in buildings, but their actual penetration into the construction sector is almost negligible. Likewise, there is a very important line of action aimed at optimising the use of natural materials, such as locally-sourced plant biomass

and its derivatives, which can have a negative carbon footprint and also help to conduct improved agricultural and forest management.

Smart glazing components for buildings, such as chromogenic and spectrally selective materials, have been developed and are commercially available. Smart glazing materials can control heat flow through transparent elements and optimise daylight performance indoors. Phase-change materials can store heat in buildings and release it when needed. Important recent research has resulted in the development of high-efficiency components.

The passive design of buildings, including passive heating and cooling systems and techniques, and natural lighting design, contributes significantly to reducing their energy consumption. The use of passive cooling and heating systems in buildings, which include solar capture and storage techniques, thermal protection, heat dissipation and heat amortisation, have been shown to substantially reduce the demand for cooling in buildings and reduce the need for additional electricity.

On the other hand, technologies aimed at lowering the ambient temperature of cities, and thus reducing the heat island effect and the cooling demand of buildings, have made significant progress in recent decades. There is great potential for the development and use of coatings based on cold and supercooled materials: white and infrared reflective materials, as well as plasmonic, photonic and fluorescent materials, which combine high reflectance and high thermal emissivity.

The use of these advanced mitigation materials, when combined with vegetation and other dissipation techniques, can contribute to the reduction of up to 30% of the cooling load of buildings.

Finally, the digitisation of the building sector can have a very significant impact on the future energy consumption of buildings. Smart information and communication technologies (ICTs) can manage the operational needs and resources of buildings in a comprehensive manner, reducing energy consumption and satisfying comfort and sanitary needs. Smart meters can provide users with useful information about their energy consumption and help utilities companies better manage electricity loads. The establishment of blockchain technologies, in turn, enables real-time transactions between users and communities in a transparent, and potentially fairer manner, if it is carried out with the arbitration of intermediary public management entities.

In addition to ICT digitisation technologies, smart grid systems that integrate advanced power generation and supply solutions, including renewables, can optimise the use of energy resources in settlements and promote collective green strategies.

3. UNMET NEEDS

Within the framework of the Missions Valencia 2030 programme, and the Strategic Plan for Public Procurement of Innovation described above, this

proposal is motivated by the need to implement solutions related to PPI Line 3: Urban Planning and Sustainable Habitat: Adaptation and renovation of infrastructures, equipment, buildings and homes, public and private, in order to optimise their energy efficiency, minimising the city's energy demand and emissions in a scenario of climate neutrality.

For this reason, it launches the Preliminary Market Consultation phase aimed at companies and organisations that intend to collaborate with the Valencia City Council in response to this challenge, developed more extensively in "Section 5 Specific Goals" of this same document, providing information that improves the definition and scope of the potential Public Procurement of Innovation projects to be tendered.

4. GENERAL GOAL

The general goal of this project is to collect the necessary information to prepare a Framework Agreement on the Public Procurement of Innovation, with different batches, provided that the result of the Preliminary Market Consultation (PMC) is in the terms provided for the Public Procurement of Innovation. This Framework Agreement on the Public Procurement of Innovation will give rise to the different contracts as provided for in the Public Sector Contracts Law.

It should be noted that, depending on the state of the development and the solutions proposed, it may give rise to other types of bidding, whether they are ordinary public procurement tenders, because the market is sufficiently mature, or pre-commercial public procurement procedures, as well as partnership procedures for innovation, if the results of the PMC were in very early stages, far from commercial solutions.

Additionally, another of the goals set out in this project is to inform economic operators about the plans and contracting requirements of the Valencia City Council.

More precisely, the specific goal of the project is to stimulate R&D&i activities in the private sector through the PPI to generate solutions for the main needs currently existing in the City Council within the scope of the Valencia 2030 Climate Mission.

5. SPECIFIC GOALS

To identify innovative solutions and technologies, of any nature, with potential application within the City of Valencia, which enable its City Council to improve the energy efficiency of facilities, infrastructures and public buildings and promote the adoption of solutions of this nature in buildings, homes and private service facilities, within a context of climate neutrality promoted by the Valencia 2030 Climate Mission.

Within the scope of impact of this PMC, the City Council's interest in also identifying technologies and solutions that specifically affect some of the key economic sectors for the success of the Valencia 2030 Climate Mission (tourism,

agri-food, culture and leisure, commerce and services) is emphasised, promoting its transformation towards a sustainable economic model in a scenario of climate neutrality. Likewise, the City Council wants to highlight its interest in identifying proposals that contribute to promoting the economy of knowledge and entrepreneurship within the city.

In a non-exhaustive way, the aim is to identify innovative technologies and solutions that enable it to:

a. Deploy smart energy management and demand response systems for homes, businesses and public infrastructure.

b. Explore the potential of digital twins for municipal energy management, including integrating the consumption of public and private spaces.

c. Intensify the use of district networks and micro-grids linked to energy communities. Including with digitised management systems.

d. Implement systems to improve envelopes, exterior and interior thermal insulation systems (mainly those manufactured with a circular economy model) and insulation systems with passive smart thermal heat conduction.

e. Promote the improvement of energy insulation in buildings and homes within the city in a massive way, through standardised technical solutions and business models that enable the grouping of demand and joint action on a large scale.

f. Implement insulation systems based on locally-sourced plant biomass.

g. Implement and promote the adoption of coatings with improved reflective and emissive properties.

h. Explore the potential of coating and lining materials with CO_2 absorption capacity.

i. Deploy constructive solutions based on enclosures with improved thermal properties.

j. Promote the adoption of domestic waste heat recovery systems (individual and community) from greywater, household appliances, and centralised thermal energy systems, in combination with heat transformers based on the heat pump principle. Including for greywater heat recovery systems from urban collectors.

k. Implement industrial and commercial heat recovery systems (large data processing centres, laundries, bar and restaurant kitchens, slaughterhouses, logistics distribution centres, etc.) hybridised with medium and high temperature heat pumps and refrigeration equipment:

l. Deploy air conditioning systems based on high-efficiency heat pumps to replace conventional heat generation systems.

m. Deploy air conditioning and DHW systems based on high-efficiency centralised heat pumps and modular design to replace conventional generation systems based on fossil fuels. Including hybrid solutions with conventional systems and integrated with local renewable energy generation systems and energy storage with smart control of cold, heat and DHW production.

n. Explore the potential of geothermal-based air conditioning solutions, including working with the city's groundwater and its low-pressure water network.

o. Implement and promote the adoption of solutions aligned with the goals of the New European Bauhaus in new buildings and urban plans.

p. Explore the use of environmental measurement systems in public spaces, rebalancing green and blue infrastructures.

q. In general, promote the improvement of energy efficiency and the reduction of emissions in public and private buildings, spaces, infrastructures and facilities within the City.

6. EXPECTED RESULTS

As a result of this consultation, the aim is to obtain the necessary information to activate the bidding processes that are considered appropriate as described in section 4 “General Goal” of this document.

The Valencia City Council will study the proposals for solutions that are submitted and may use them, in accordance with the provisions of Article 126 of Law 9/2017, of 08 November, regarding Public Sector Contracts, to define the detailed functional or technical specifications that can be used in the contracting procedures for goods or services that, subsequently, can be summoned, fundamentally, although not exclusively, through the Public Procurement of Innovation (PPI) procedure.

The Valencia City Council will record, in a report of conclusions, the actions carried out within the framework of the Preliminary Market Consultation. The list of entities participating in the consultation will appear in said report and the next actions to be carried out by the entity will also be established. This report will form part of the eventual procurement files that derive therefrom.