AmsTErdam BiLbao cItizen drivEn smaRt cities

Deliverable 2.3: Common methodological framework for Vision development

WP2, Task 2.2.2

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[1] PU = Public

PP = Restricted to other programme participants (including the Commission Services)

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Abbreviations and Acronyms

Acronym	Description
SCPG	Smart City Planning Group
LH	Lighthouse City
FC	Fellow City
SECAP	Sustainable Energy and Climate Action Plan
SEAP	Sustainable Energy Action Plan
PESTLE	Political, Economic, Social, Technological, Legal, Environmental
SWOT	Strenghts, Weaknesses, Opportunities, Threats
WS	Workshop
CS	City System

Table 1. Abbreviations and Acronyms

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0. Executive Summary

This document provides a common methodological framework for the development of a City Vision, which will need to be adapted to the specific context, ambitions and timeline of each of the ATELIER partner cities.

Continuing with the alignment of ATELIER WP2 and the Cities4ZERO urban decarbonisation methodology, once the Smart City Planning Groups (SCPG) have been designed in each ATELIER city (D2.2) and main strategic planning documents of each city have been reviewed (D2.1), this document works as a guideline for city diagnosis and city visioning processes, using foresight as the main tool to develop a shared co-diagnosis, and co-visioning 2050 process.

Along the report details about the main elements, tools to be used and procedural steps of each of the main sequences of foresight processes towards a City Vision development are brought. These are: 1/analysis of global city trends by 2050, 2/city diagnosis, 3/scenarios' generation and 4/ City Vision agreement. These four sequences are mainly supported by an intensive engagement process, involving key local stakeholders through the SCPGs in the development of each of them; and by an urban energy model that brings a quantitative dimension to the discussion, offering the possibility of developing different scenarios.

Apart from the main concepts description, the deliverable presents a general overview about what would come after stating a City Vision 2050, summarizing the main points to be covered by a strategic planning process that finally becomes an Action Plan, which can take the format of an updated SECAP for ATELIER cities. For that an integrated city planning approach in partner cities is key for further deployment of PEDs in connection with the City Vision . In this sense, the scaling up of smart solutions in the Lighthouses should be addressed in the City Vision

Finally, the mtCity of Amsterdam aim elements of 2050 city visioning process in the City of Amsterdam, whose processes took place before the project. The fact that Amsterdam, as a lighthouse city in ATELIER project, has already developed their city ambition/vision following their own method is a good opportunity to enrich proposed process for city vision creation in other ATELIER cities.

The City Vision development process in the ATELIER project represents a good opportunity to continue with the technical evolution of the Cities4ZERO methodology, which will be applied in 8 cities, fine-tuning and consolidating a method already tested in diverse European cities.

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1. Introduction

Through WP2, a planning process and several tools are deployed to enable partner cities to produce their own City Vision 2050 *as a preferable future towards which the cities should move and allows the identification of the pathways to go from the present to the preferable future* (Ortegon-Sanchez, Tyler, 2016)[2]. This process will guide, in a collaborative and a coordinated way, the urban energy transition and aims to integrate it into their planning procedures for a more effective implementation.

With that purpose, the whole flow of this WP is structured according a specific methodology that is called *Cities4ZERO*[3]*.* This guideline, is a step-by-step methodology that might support and help cities through the process of co-developing the most appropriate strategies, plans and projects as well as looking for commitment of key local stakeholders for an effective transition; all from an integrated planning approach.

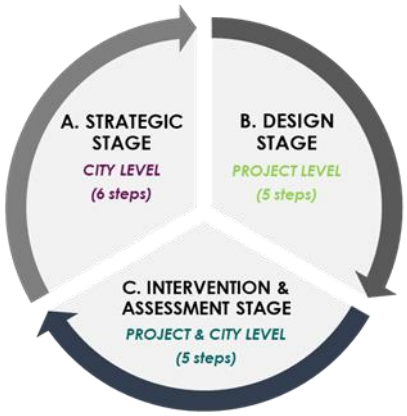

Figure 1. Figure 1. Cities4ZERO overall process. Source: Urrutia et al (2019)

The *Cities4ZERO* methodology has been successfully tested in several cities along the SmartenCiity project[4] . Through them, it had been possible to conclude how the methodology has favoured an integrated urban planning approach including behavioural changes and innovative attitudes of the main stakeholders involved (through several co-vision generation workshops). Specifically, Cities4ZERO methodology (see Figure 2 and Figure 4) has demonstrated to be an adequate engagement tool and it is precisely what the process of co-defining a city vision in the long term should do, it generates consensus and confidence in long-term changes[5].

Taking this general methodology as a starting point, cities will be able to co-design their own working method, adapting it to their context and their technical, political and governance reality. To promote this process of adaptation and contextualization, this report includes the example of the City of Amsterdam in which it is shown how the city has designed their own methodology based on their experience and trying to review it in relation to the Cities4ZERO foresight methodology.

Within the three Cities4ZERO methodology Stages, WP2 is focused on the first, the Strategic Stage (see Figure 1), providing a strategic planning framework which enables the cities to:

[2] Ortegon-Sanchez, A; Tyler, N (2016) a Vision for an 'Ideal' Future City: A Conceptual Model for Transformative Urban Planning, Transportation Research Procedia,Vol. 13. ISSN 2352-1465, https://doi.org/10.1016/j.trpro.2016.05.002.
[3] Urrutia, K et al (2020) *Cities4ZERO: The Urban Transformation Strategy for Cities' Decarbonization* (https://doi.org/10.3390/su12093590)
[4] SmartEnCity SCC-1 H2020 project (www.smartencity.eu/)
[5] Other European projects from the EIP-SCC have developed similar methodologies but mainly more focused on impact assessment tools (CITYkeys, Triangulum, GrowSmarter, Replicate, SharingCities) or a more comprehensive urban regeneration planning (Remourban, Sparcs).

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- Engage key city stakeholders through an institutional analysis and the SCPG (Step 1 and D2.2 in ATELIER project).
- Review the planning framework of the city (Step 2 and D2.1 in ATELIER project).
- Analyse and diagnose the city' strengths and opportunities in a collaborative way.
- Formulate the co-visioning process for urban transformation towards energy transition, including potential future scenarios.
- Develop the strategic plans (SECAP in ATELIER case) to deploy that City Vision, identifying the key projects for the city.

In the case of D2.3 – *Common methodological framework for Vision development*, the work developed corresponds to *Step 3. Diagnose and, Step 4. Envision* of Cities4ZERO methodology. In this report the methodological framework for a co-diagnosis, a co-scenario development and a City Vision 2050 generation will be described.

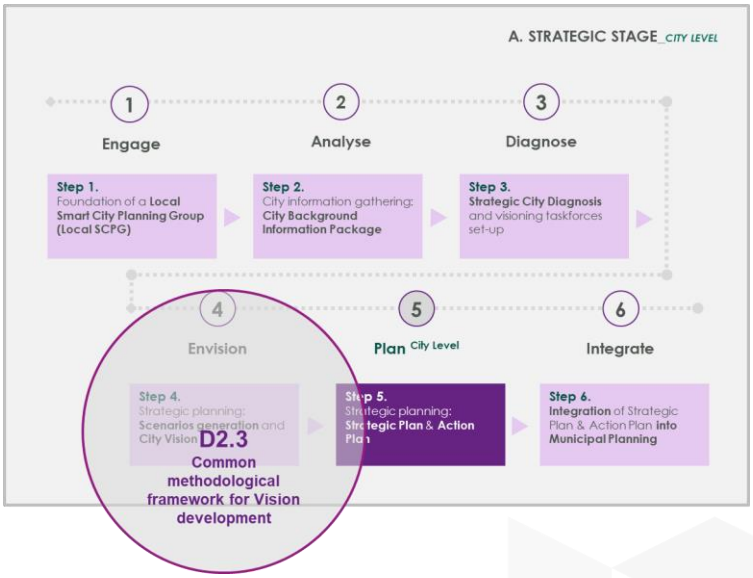

Figure 2. Strategic Stage in Cities4ZERO approach by Tecnalia (Urrutia et al, 2020 - https://doi.org/10.3390/su12093590)

1.1. Purpose and Target Group

The main purpose of this deliverable "*D2.3. Common methodological framework for Vision development*" is to outline the methodological framework for integration of energy and urban planning mechanisms for vision development, according to strategic baselines and ambitions, including diagnosis and scenario generation as well and assessment activities. It is the first main outcome of *Subtask 2.2.2: Vision co-development roadmaps*. Once the methodological framework for vision development is defined, it will be adapted to local conditions, ensuring proper implementation according to each city context.

This document presents first, the challenge of implementing climate adaptation and mitigation initiatives, and the need of doing so from an integrated planning approach. After that, the conceptual basis of the methodological framework will be explained (section 4), focusing first on the definition of the foresight methodology principles and its translation to urban and energy planning areas of knowledge and second, explaining to what extent the City Vision concept is

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defined for the ATELIER project. Once these concepts are explained, the general methodological framework will be described, going into detail of its main elements, processes and tools.

Apart from the conceptual basis explanation, section 5 presents the main guidelines for developing an action plan based on the City Vision 2050. Although this part is not specifically included in Steps 3 and 4 of the Cities4ZERO methodology, it has been included so that cities could better understand more specifically the City Vision generation and its relationship with the urban energy model in each city. The City Vision will guide the further scaling up of PEDs in the cities and delivers the long-term commitment of the city to further implementation and upscaling of PEDs beyond the lifetime of ATELIER. In the City Vision 2050 better alignment or even integration of mechanisms for energy, mobility and urban/ spatial planning is promoted, which fits to the system approach in ATELIER.

Moreover, section 6 explains Amsterdam's own methodological approach followed to define their city vision and included in the recently published *The Amsterdam Climate Neutral Roadmap 2050* (spring 2020). Differences and commonalities between Amsterdam´s process and Cities4ZERO are identified to enrich each other. Thus, lessons from Amsterdam experience will be considered in ATELIER cities vision development. This will help to avoid potential problems and to organize correctly the process and the relevant elements to be considered. In the case of Amsterdam, the analysis presented in section 6.3 has been useful to identify the points that can be further developed thanks to proposed method. This information will be very valuable to define Amsterdam´s roadmap to be followed in WP2 of ATELIER project (to be included in deliverable 2.4 to be submitted in June 2021). The target audience for this report are the municipal technicians involved in the development of the ATELIER project in each city, as well as the rest of the project partners, mainly those involved in work packages 3, 4 and 7.

1.2. Contributions of Partners

The table below depicts the main contributions from project partners in the development of this deliverable.

Partner short name	Contributions
Tecnalia	Work Package leader. Content from section 1 to section 4, and support to Amsterdam city with their contribution approach and consolidation.
Cartif	Contributions to Section 5
Amsterdam	Contributions to Section 6
UDeusto	Deliverable reviewer
AUAS	Deliverable reviewer

Table 2. Contribution of Partners

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2. Objectives and Expected Impact

2.1. Objectives

As it was mentioned before, this report is the first main outcome of "*Subtask 2.2.2: Vision co-development roadmaps*" so its main goal is to define a common methodological framework to help LH and FC cities in the process of co-defining and deployment of their own City Vision 2050, based on a co-diagnosis and the co-generation of potential 2050 scenarios.

To achieve this objective, we do not start from scratch, different methodologies have been reviewed, specifically those developed by the EIP-SCC projects which aim to develop different smart city projects and strategies (Figure 3).

Figure 3. European Innovation Partnership on Smart Cities and Communities (EIP-SCC). Source: SPARCS project

Among all of them, the foresight experiences developed in SmartEnCity[6] project (www.smartencity.eu/) seem to be good practices to be replicated. Those experiences were developed based on the strategic planning processes of five European cities which were intending to co-create an urban decarbonization / energy transition strategy in the short-mid-long term, using the foresight method as a tool.

Apart from the SmartEnCity approach, the methodological framework defined in the Positive City Ex Change[7] project is also interesting, but still there are no replicable results because it is being implemented since 2020 in seven European cities, although its approach is more based on integrating the SDGs as an urban transition instrument and not so much on the specific objectives for energy transition and decarbonization.

This deliverable based on the Cities4ZERO methodology aims to be a collaborative process, in which the main stakeholders are called to participate (in the framework of the SCPGs procedures, see D2.2[8]) in the whole City Vision generation process. It also will guide cities on how to achieve their urban energy transition challenges, showing them a common path for

[6] SmartEnCity SCC-1 H2020 project (www.smartencity.eu/)
[7] +CityxChange (Positive City ExChange) SCC-1 H2020 project (https://cityxchange.eu/)
[8] *D2.2_Report on Smart City Planning Groups (SCPGs)* which explains the SCPGs general characteristics and potentialities to establish a suitable governance model for City Vision creation.

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effective implementation, considering integral urban planning principles as a key aspect to be included in their existing planning procedures.

Taking this general methodology as a starting point, cities will be able to co-design their own working method, adapting it to their context and their technical, political and governance reality. To promote this process of adaptation and contextualization, this report includes the example of how the City of Amsterdam has defined their city vision 2050. The explanation of how the city has designed their own methodology and the experience acquired are very valuable for the cities in the process of city vision creation. Moreover, Amsterdam experience is reviewed it in relation to the Cities4ZERO foresight methodology allowing the enrichment of both processes.

2.2. Expected Impact

This deliverable sets the ground for eight ATELIER cities to develop their own roadmaps towards a 2050 City Vision development (D2.6), finally inspiring the updated SEAP/SECAPs of all cities (D2.8). Apart from this direct impact, the definition of a methodological framework for integration of energy and urban planning mechanisms for vision development might influence in:

- The development of a common and adapted methodology that considers the experiences of each previous city, as a means to improve and reinforce planning coordination and integration to overcome energy and decarbonisation challenges.
- Reinforce a better alignment and integration of energy, mobility and urban/spatial initiatives deployed, allowing combined solutions and policies with a wider range of impact than if developed independently.
- For the SECAP, the definition of a methodology based on the foresight concept could be a helpful tool to achieve both energy commitments in the medium term (horizon 2030) and those oriented to the long term (horizon 2050)
- Processes defined as a structured, systematic, participatory process of gathering knowledge and building a long-term City Vision, aimed at making decisions in the present and planning coordinated and comprehensive actions in the future.
- A systematized and coordinated process could help to evaluate the co-vision performance in terms of engagement and participation of the stakeholders involved, thus favouring its transparency and future deployment.
- The possibility of defining a common methodology and its application in eight partner cities, will improve and refine the City Vision development based on their experience and results.
- Having a proven and tested methodology could lead to a greater impact on replication and upscaling in other case studies.
- Impacts will be assessed by comparing the performance indicators in reference alternatives (BAU from City Scenarios definition) and the performance indicators in WP9.

3. Overall Approach.

Through this report, a common methodological framework is shown for all the partner cities. For this, the ATELIER methodological framework for a collaborative diagnosis and scenario

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development and a City Vision 2050 co-generation, is supported by the Cities4ZERO foresight methodology adapting the framework to the project requirements.

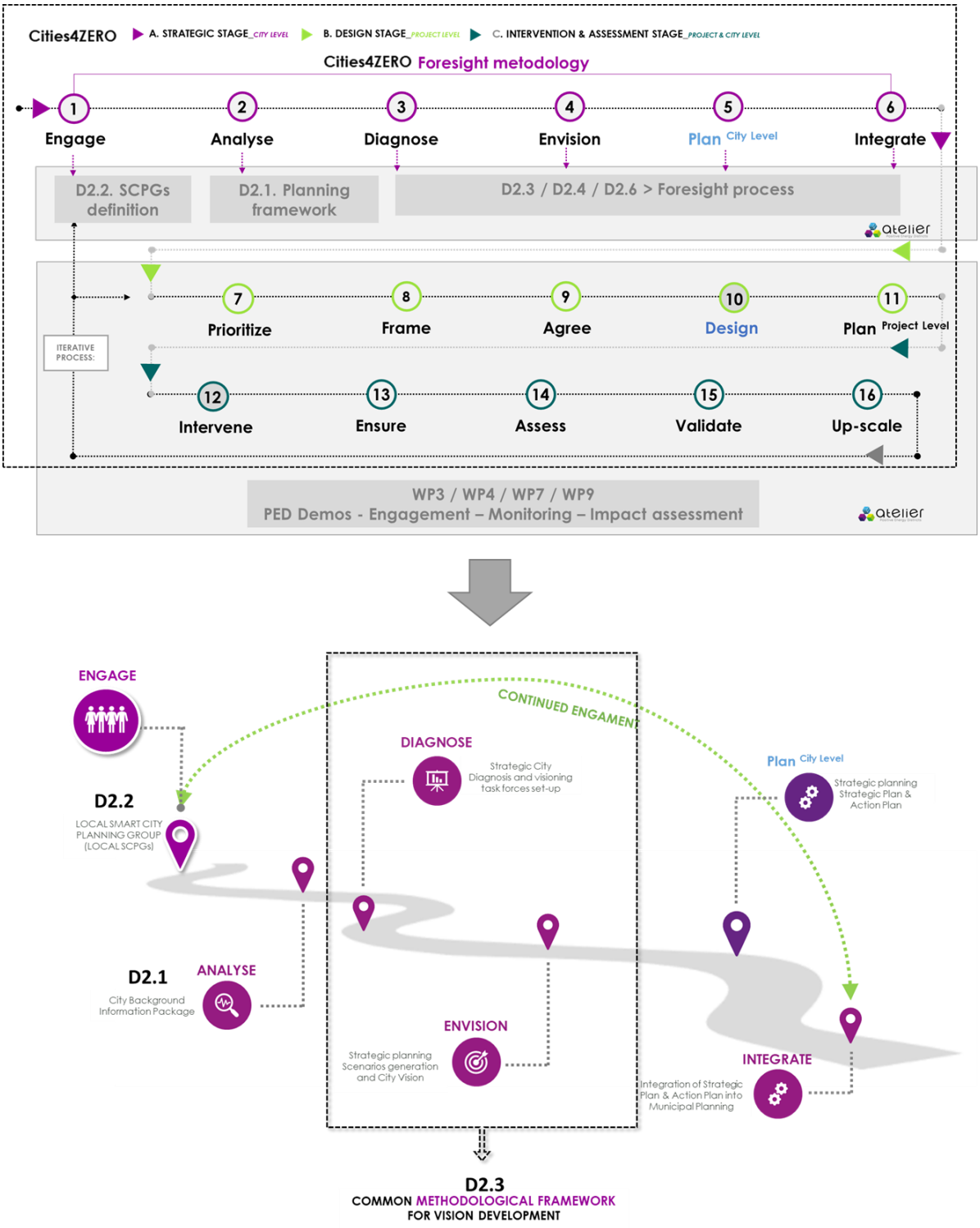

Figure 4. Relation between Cities4ZERO methodology and its translation to ATELIER methodological framework. Source: own elaboration based on Urrutia et al (2020)

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In the above figure, it is shown the correlation between both methodological frameworks and its translation to this deliverable (Figure 2), in which this deliverable is based on, specifically on the Strategic Stage of Cities4ZERO methodology, through which it seeks to define a comprehensive, coordinated and participatory City Vision.

Along the document the concepts, procedures and tools that structure the Cities4ZERO Strategic Stage or **Cities4ZERO foresight methodology** are brought out in Section 4. Thus, this section includes the main aspects that make understandable the evolution from Cities4ZERO foresight methodology to the ATELIER methodological framework (Figure 4). In this sense, the creation of a City Vision 2050 has not been thought of as an isolated action or disconnected from the rest of the ATELIER actions or co-development processes (engagement, diagnosis, PED implementation, etc.).

The foresight instrument has been defined considering the ATELIER´s holistic approach and the current partner cities´ planning frameworks. From this point, the ATELIER project is deploying a number of tools to enable cities to produce their own City Vision for guiding their urban energy transition challenges and integrate it into their planning procedures for effective implementation.

For this evolution explanation, firstly a reflection about the challenges to which the ATELIER project wants to respond has been prepared (see subsection 4.1). In relation to this general context, subsection 4.2 delves into the foresight concept and its use for the City Vision generation. This is key to understand the structure and concepts of the whole methodological framework that is explained throughout subsection 4.3. titled *"Cities4ZERO foresight methodology: insights, general concepts and structure".* In this section, the integration of tools developed for modelling energy demand and supply side, the evolution of the energy balance and the impact-based decision procedures will be integrated as a qualitative approach for the co-visioning process and also to update current Action Plans (SEAP and SECAPs) and existing long-term City Vision.

This subsection is divided in two main parts, first, the description of the whole City Vision generation process and second the insights of the four key aspects that define the methodology, these are: global city trends, city diagnosis, city scenarios and City Vision. Each of these elements has its own description throughout subsection 4.3, including a conceptual definition of each of them, as well as a description of the methods, procedures and tools on which they are based to contribute to the City Vision generation.

Once the key aspects that set up the methodological framework have been specified, Section 5 includes a general overview through Step 5 and Step 6 of the Cities4ZERO foresight methodology which are the plan and its integration into the city planning system. Throughout this section, some of the key aspects to be successful in developing a Roadmap or an Action Plan are identified, as well as the necessary actions for its design and pre-implementation.

Finally, in Section 6, Amsterdam´s City Vision methodology and its Roadmap 2050 are defined. Furthermore, the Amsterdam ATELIER team evaluates the Climate Neutral Roadmap published in spring 2020. Collaboration and knowledge sharing are key aspects for ATELIER project. Amsterdam´s lessons learned might support participating cities to their own City Vision within the Cities4ZERO methodological framework.

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It is important to note that the Amsterdam team has explained its methodological approach by integrating the concepts of the Cities4ZERO methodology into their own evaluation process; supporting the rest of the participating cities in having an integrated vision between the general methodology and the Amsterdam experience.

This report is connected with deliverables D2.1 "*City Background Information Package*" and D2.2. "*Local smart city planning group".* Both deliverables have been defined with the basis of the Cities4ZERO reference framework and the two have shown methodological improvements or lessons learned in terms of engagement actions, improvements which have been included in this report.

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4. Cities4ZERO Foresight methodology for Vision Development

4.1. The challenge

Cities are currently facing the increasing impact of climate change as well as high levels of urban pollution, both issues are a partial consequence of the high greenhouse gas emissions of cities worldwide.

In this sense, cities have two main ways of coping with this challenge. Firstly, through climate adaptation actions, modifying the urban landscape and infrastructures to better acknowledge the increasing impacts of stormwater, heatwaves, sea-level rise, droughts, etc. Secondly, by mitigation actions, locally reducing CO_2 emissions to a level that slows down the greenhouse effect the planet is suffering, hence reducing the future impact of Climate Change-related events.

Cities must therefore be committed to decarbonise their energy systems, which encompass several city systems at the same time, by implementing long-term City Visions that foster the implementation of climate mitigation actions. In this sense, the Covenant of Mayors initiative provides support to this framework as well as integrated planning methodologies [9] that intend to facilitate the deployment of such long-term strategies and mitigation actions.

Regarding integrated planning procedures, cities generally lack an effective integration among city systems (e.g. transport – energy; waste management – energy; etc.). among municipal departments/ agencies (interdepartmental silos), and among administration levels (multilevel: municipal/ regional/ national), which poses a significant risk in the coordinated implementation of climate mitigation strategies and projects. A high level of planning integration is not only necessary at city level, but also at district project level, where achieving the fulfillment of

[9] 1- Cities4ZERO urban decarbonisation methodology (https://doi.org/10.3390/su12093590)
2- RemoURBAN – integrated urban regeneration model (https://doi.org/10.9770/jesi.2017.4.3S(8))
3- Smart City Guidance Package (https://smart-cities-marketplace.ec.europa.eu/news/smart-city-guidance-package)
4- Integrated Sustainable Urban Development (EU)
https://ec.europa.eu/regional_policy/sources/docgener/informat/2014/urban_en.pdf

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Positive Energy Districts (PEDs) becomes an even harder milestone in cities climate mitigation action.

Besides the need of an integrated planning approach, many cities lack a long-term vision which enables them to anticipate potential future events, and therefore make present decisions based on that visioning thinking.

4.2. Why a foresight methodology?

4.2.1. Foresight concept

To achieve a future smart city model, the use of foresight tools allows cities to combine the different functional systems of the city as well as to provide useful information on how current cities operate, evolve and facilitate participation and coordination of different stakeholders in the smart city planning processes.

We understand cities as a complex and diverse system, where uncertainties and challenges faced lead us to a need for understanding urban environments as dynamic structures in continuous evolution. From this systemic and dynamic perspective, it is important to accompany the urban planning process with prospecting tools, thus helping both planners and other interested parties to look beyond the short or medium term (City Vision 2030-2050).

Regarding the ATELIER project and the integrated planning methodology adopted (Cities4ZERO), foresight is chosen as the best tool to perform the prospective exercise needed to achieve a future smart City Vision (Figure 2). The concept of foresight can be defined as a systematic, participatory process of gathering knowledge and building a long-term City Vision, aimed at making decisions in the present and planning coordinated and comprehensive actions in the future (Tatar, Kalvet, and Tiits, 2020). While forecasting relies primarily on quantitative tools to forecast the future, foresight generally uses qualitative tools such as scenarios and visions. Foresight allows us to analyze, evaluate and manage uncertainty, which is itself a valuable exercise for city decision makers.

A foresight exercise should be undertaken using three tools: horizon scanning, scenario design, and visioning. Different methodologies define the design of scenarios according to four sequential stages:

- identification of the factors of change that can affect cities and evaluate them for impact and uncertainty
- group critical uncertainties or key drivers into a 2x2 matrix of scenarios
- build scenarios and develop narratives (including a multi-criteria decision assessment)
- determine the implications of the scenarios

These stages should be based on a systematic and continuous participation process with urban experts. Furthermore, these stages can be supported by quantitative and qualitative methods, suitable to be connected to foresight process (Table 3).

Quantitative Methods	Qualitative Methods
Analysis of city trends	Surveys

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Temporal series	**Interviews with experts**
Simulation models	Delphi analysis
Systems dynamics	**Analysis of city trends**
Multi-criteria decision analysis	**Scenarios generation**
Cost-benefit analysis	PESTLE analysis
Risk analysis	**Visioning**
Input-output analysis	Incasting/ backcasting
Gamification	Decision trees
Complementary instruments	
	Mind mapping
Benchmarking	**Road mapping**
Environmental scanning	**Brainstorming**

Table 3. Quantitative and qualitative methods that can be used connected to foresight process (in bold those suggested in ATELIER). Source: Fernández Güell (2011)[10]

4.2.2. ATELIER City Vision concept

The main result of the foresight process in the partner cities will be the formulation of a Bold City Vision, which will enlighten the pathway towards carbon neutrality in each city. The key elements of this City Vision will fix the long-term goals of the city to effectively and fully decarbonise the energy system of the city. Complementarily, a detailed Roadmap will describe which specific actions those goals/ City Vision will be achieved.

Accordingly, a City Vision delivers long-term commitment to further implement and upscale PEDs and complementary climate action initiatives beyond ATELIER project's lifetime. Furthermore, a shared City Vision among all key local stakeholders will reinforce a better alignment and integration of energy, mobility and urban/spatial initiatives deployed (Figure 5), allowing combined solutions and policies with a wider range of impact than if developed independently.

[10] Fernández Güell, J. M. (2011), "Recuperación de los estudios del futuro a través de la prospectiva territorial", Ciudad y Territorio – Estudios Territoriales, No.167, pp. 11-32. http://oa.upm.es/11652/1/INVE_MEM_2011_106233.pdf

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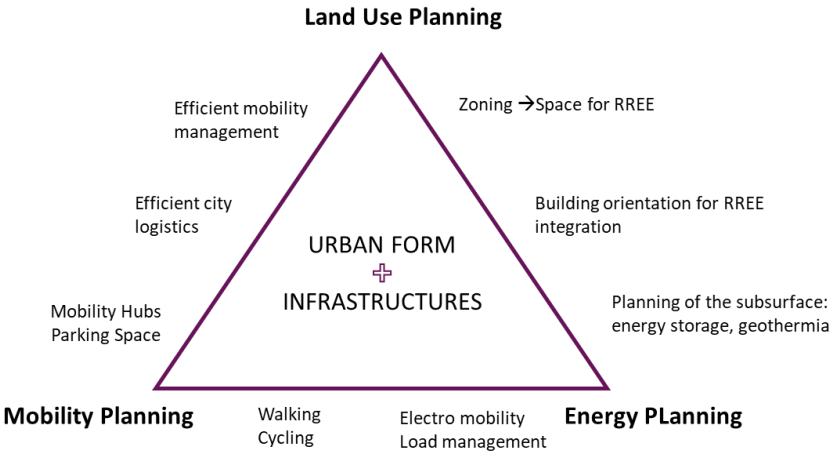

Figure 5. Integration of Energy, Mobility, and Land-Use Planning. Source: own elaboration

In the ATELIER City Vision 2050, better alignment or even integration of different planning mechanisms (energy, mobility and urban planning) is promoted. The SUMPs and SECAPs still start from a rather sectoral point of view and have not been able yet to sufficiently address the different national (and even regional) strategic spatial planning mechanisms, for that an integrated city planning approach in partner cities is key for further deployment of PEDs in connection with the City Vision[11]. In this sense, the scaling up of smart solutions in the Lighthouses should be addressed in the City Vision.

The visioning process (as a co-working method) not only allows to answer about how the future city model is going to be, it is also a tool that should help and improve engagement and participatory processes generating the trust and collaboration structures necessary to meet the urban challenges that cities face through a strategic and collaborative orientation of their planning system.

4.3. Cities4ZERO foresight methodology: insights, general concepts and structure.

4.3.1. The process overview.

The Cities4ZERO foresight methodology for vision development is embedded within the Step 3: DIAGNOSE and Step 4: ENVISION of the overall Cities4ZERO methodology[12] for a smart urban decarbonization transition. Previously, the SCPG intended to involve local stakeholders in the identification of the critical topics and main inputs for scenarios and City Vision generation in the latter step (see Figure 6).

[11] EEA (2016). Urban sustainability issues - Enabling resource-efficient cities. Copenhagen: European Environment Agency.

[12] The overall Cities4ZERO methodology (Urrutia et al, 2020) consists of 3 stages (a. Strategic Stage; b. Design Stage; c. Intervention & Assessment stage) and 16 steps. Foresight process, entailing Steps 3 and 4, belongs to the Strategic Stage, finally generating the Bold City Vision. (see Figure 2)

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The main objective of foresight is to generate and analyse future scenarios to support the development of a common City Vision. Based on this future City Vision, decisions can be made, strategies elaborated, actions planned, and efforts mobilized. Moreover, making use of participatory methods, the Cities4ZERO foresight aims to assist the formulation of the cities' strategic planning corresponding with STEP 5: PLAN^{CityLevel} of the Cities4ZERO methodology.

Regarding the vision development process, the Cities4ZERO foresight methodology comprises 4 phases detailed in **¡Error! No se encuentra el origen de la referencia.** (Tatar et al. 2020). **¡Error! No se encuentra el origen de la referencia.** illustrates the participatory p rocess carried out along the methodology. A series of workshops are held, where the local SCPG discuss key decisions of the different phases of the methodology. Current city diagnosis and global city trends are discussed during Phase 1 in a preliminary workshop (WS0). In Phase 2, local stakeholders conceive the different pathways the city can face (WS1). Finally, in Phase 3 the SCPG meets again to shape the city vision: in a final workshop (WS3), local stakeholders evaluate the results of the generated scenarios and choose, based on different criteria, the scenario that best fits the city's desired future.

Phase 1 establishes the basis for the whole vision development process by setting up the city's integrated energy planning steering group (local SCPG), identifying the city's main challenges and expectations, and involving relevant stakeholders. The city diagnosis is also performed in this phase: the city's energy characterization is carried out and the city-specific key end-use sectors, with the savings and improvement potential, are identified. This phase should also serve to sketch the city's future trends: already committed plans and actions should be identified, city interests discussed (e.g. focused-actions in specific city areas, energy/emissions reductions, citizen engagement…), and city expectations addressed (is there any expectation/willingness on how certain energy technologies are expected/desired to evolve in the city? E.g. electric vehicle fostering, heat pump penetration, solar photovoltaic development…).

In Phase 2 the city's future scenarios are generated. Based on the global city trends, a first set of contextual frameworks of the city are shared with local stakeholders. This first qualitative focus sets the background from which different future views of the city will be assessed. In further workshops, local stakeholders should discuss different approaches regarding urban energy-related key topics. This discussion should feed the storylines of the scenarios that will be modelled. Through the prioritization of these key aspects and the selection of energy measures to be implemented, local working groups will shape different narratives which should support the development of the final City Vision in Phase 3. Figure 7 shows an example of scenarios issued from the workshop discussion.

At this phase, the main objective of the generated scenarios is to later support the decision-making process. They should therefore be generated ad hoc to the specific city context; i.e. the scenarios should reflect the city's expectations and address its needs. Therefore, work included in Phase 2 should incorporate at least qualitative data, and where possible, quantitative information, concerning the implementation and savings potential of the selected measures in order to accurately model them in the outlined scenarios.

Once the narratives for the scenarios conceived in Phase 2 are modelled, results are obtained for each scenario. In Phase 3, these are assessed and discussed by the local stakeholders,

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who should select one, or a combination of scenarios which will inform the “master scenario”. This master scenario describes the agreed City Vision, and it is the basis for the development of the city’s strategic planning process in Phase 4, where the City Vision is transformed into goals and specific actions.

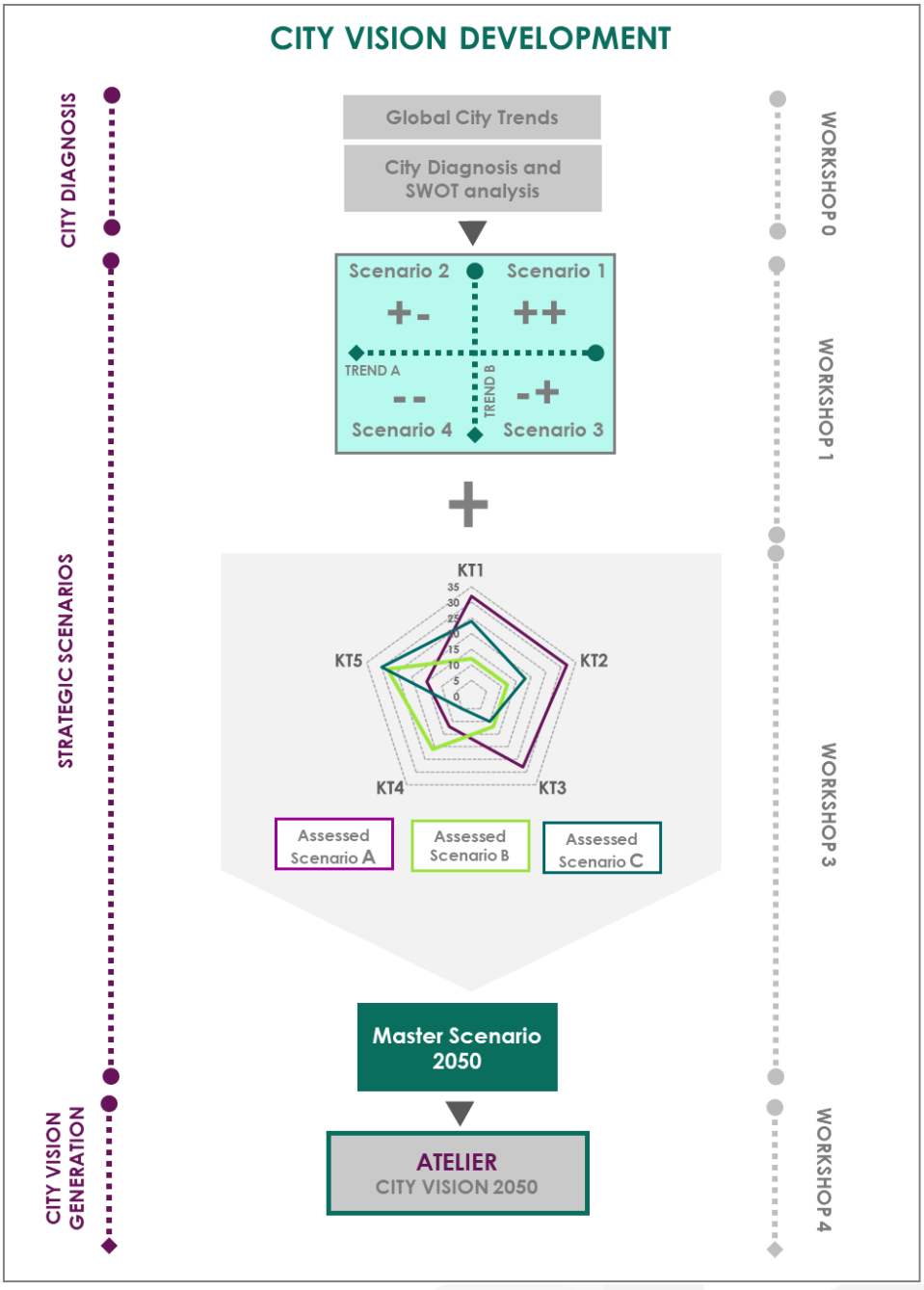

Figure 6. Development of a City Vision 2050_Cities4ZERO Stage A approach. Source: own elaboration based on Tatar et al (2020)

In this context, it is important for cities to define overarching, ambitious long-term goals. But it is also very important to define local and specific short-term objectives and actions that will

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contribute to improve urban strategic planning, and, in the end, to achieve the longer-term vision. After identifying big challenges and opportunities for growth, job creation, activity development and welfare, cities have to design a clear Action Plan, with priorities and locally-customised solutions.

Regarding ATELIER cities, each of them will have to adapt this generic process to their specific local context and planning process. Their intentions about each local process will be described in D2.4, as well as the events and process followed altogether with their City Vision in D2.6. After that, they will be ready to start the development of their SECAP update (D2.8).

The main points of foresight process are described in the table below:

Phase 1. SETTING UP THE SCENE
1. Set up the integrated energy planning steering group (local SCPG)
Key partners in energy transition according to the minimum topics of: energy, mobility, ICT, governance, and citizen involvement Decide on involving external expert/consultant
2. Set the strategic question
How can we make our city carbon-neutral by 2030?" Decide on involving external expert/consultant
3. Analyse/review the base situation, city characterisation, context analysis
Requires desktop analysis and validation within the steering group
4. Identify the driving forces of change
Analyse today's smart city trends and issues by applying the "external opportunities" and "external Identify the most influential trends and/or drivers, e.g., globalisation, urbanisation, technological breakthroughs, resource scarcity, oil price change or digitisation Assess and rank the trends within the task force Remember: Opportunities and threats are external to your activity. Do not mix trends with internal factors. Energy transition projects pay attention to social, economic and legal factors/barriers.
5. Determine main stregths and weaknesses
Identify specific socio-economic positive and negative aspects that characterise your development as a smart decarbonised city. Combined with the findings of step 4, the SWOT and/or 'Political, Economic, Social, Technological, Legal and Environmental' (PESTLE) etc. analysis should then provide sufficient input into scenario planning After combining information from step 4 and step 5, assess the probability and relevance of each of the main trends This should be validated in the steering group
6. Identify the driving forces of change
City planners, politicians, businesses, service providers, academia, and community representatives It is important to get a variety of insights from various fields of expertise Remember that bringing together various stakeholders and guiding their individual choices toward consensus is one of the main benefits of foresight. Additionally, the main steering group members of the whole strategic process should be heavily involved in the scenario building task.
7. Prepare for the workshop
Validate the findings of steps 4 and 5 (i.e., SWOT) among the involved stakeholders, e.g., by conducting a survey or using the Delphi method. This gives an input for speculating on the most likely visions of the future in the scenario planning workshop.
Phase 2. SCENARIOS OF THE FUTURE
8. Introduce the purpose

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Specify the aim and the expected results of the workshop and present an overview of how a mutual vision of city energy planning will be formed during the exercise.
9. Get the stakeholders on the same page
Present the overall context, focusing on the threats and opportunities that were identified in steps 4–5 and possibly validated in step 7. Use brainstorming time, during which the participants could add e.g., post-its to the “opportunities” and “threats” sections Remember that the threats and opportunities should not sound slogan-like. This action does not reflect the preferred courses of action—not yet.
10. Stablish scenario logics
Agree on 2 of the most impactful but uncertain trends that will be used for the 2 2 matrix to create scenarios. The task that already started before the workshop in step 4 should be continued in step 10. In the end, you should have 3–4 major scenarios to develop further Remember that this is the most time-consuming part
11. Create groups
Make sure that each group has the main stakeholder groups represented Assign leaders for each group If feasible, the leaders of each group could be members of the task force Each group leader will summarise their group work in a scenario description
12. Create different scenarios
Each group will work with one specific scenario based on the 2 2 matrix You may also choose the format where all groups discuss all the scenarios and you can later integrate the results The aim of the group work is to describe a future scenario whereby the city successfully takes advantage of the most important opportunities while avoiding the major threats Groups also map main preconditions that are needed for the scenario Tips: Name each scenario, name 2–3 magazine headlines from the future for each scenario, propose timeline, legend or story for each scenario; extra effort will be needed after the workshop to write up the scenarios.
13. Conclusions
The leaders of the working groups will introduce their best scenarios and their preconditions (ca. 15 min each). This will be followed by a discussion of the most attractive and realistic scenarios.
14. Develop the scenarios
Create an approximately 4-page summary for each scenario that will feed into the next steps (may happen between several workshops). Additional desk top research and expert interviews, if needed; complete and elaborate the selected scenarios by describing them in detail; developing further keywords identified during the workshop, adding numbers for trends etc.
Phase 3. SHARED VISION
15. Develop a preferred vision
Summarise the scenarios identified The goal is to reach an agreement, a common vision (may be organised in groups)
16. Move to strategic planning
What present-day decisions should we make to shape the outcome in the preferred direction, enhancing the desired future or taking actions to prevent non-desirable futures? What are the most important milestones? Draw conclusions on the main results of the (previous) workshop
Phase 4. STRATEGIES AND ACTIONS
17. Organise a follow-up event

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Feeling of joint ownership of the chosen strategies is important Follow-up meeting to present the advanced scenario(s) specified in steps 14–15 to your stakeholders, asking them for feedback and gathering more in-depth ideas for strategic planning
18. Share results
Share results on dedicated channels
19. Specify next steps
Specify next steps in the strategic planning process

Table 4. Cities4ZERO Foresight methodology step-by-step (Tatar et al, 2020)

A thorough explanation of the foresight method and the five case studies can be found at:

- Tatar, M.; Kalvet, T.; Tiits, M. ***Cities4ZERO Approach to Foresight for Fostering Smart Energy Transition on Municipal Level***. Energies 2020, 13, 3533. https://doi.org/10.3390/en13143533

4.3.2. Conceptual elements of the process

A. Global city trends

At a local level, all cities have specific idiosyncrasies. However, at a more macro-level, all cities face similar challenges provoked by a globalised paradigm, highlighting citizens' welfare, economic growth, and sustainability. Cities must therefore advocate for a long-term vision[13] that guarantees resources (in the present and the future), fair redistribution among people and welfare policies, relevant urban planning, and solutions to the environmental challenges.

In this sense, all cities are affected by forces of potential change:

> **Internal forces: strengths and weaknesses** inherent to their specific characteristics and local environment.
> **External forces: opportunities and threats** result of being part of a wider context (regional, national, international), which will affect the future of the city without its consent.

Global city **trends are connected to those external forces of change**, assuming that most of those global trends will entail different opportunities and threats for cities. It will be the cities' task to leverage those external opportunities and, at the same time, to be prepared for the effects of those external threats, so that they do not have a major impact on the city.

For instance, the **EU Commission report *"Global Trends to 2035. Geo-politics and international power"*** [14] present the main economic, societal and political global trends that will shape the world in the coming years, and which of course will have an impact in our cities. Most of those trends are cross-cutting, touching almost any sector of a city (I.e. aging global population), and some of them are clearly pointing to ATELIER project concerns, such as

[13] the definition of Sustainable Development included in Brundtland Report already referred to the need of having a common future vision: "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*

[14] Global Trends to 2035. European Commission 2017 https://www.europarl.europa.eu/RegData/etudes/STUD/2017/603263/EPRS_STU(2017)603263_EN.pdf

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Climate Change and resources competition, growing CO_2 emissions, growing urban population and climate refugees, the technological revolution, etc.

As a reference, in the case of the city of Vitoria-Gasteiz and its Action Plan for an Integrated Energy Transition 2030 (APIET 2030), these are examples of the identified trends that will be relevant for the city and this specific plan in the coming years, all categorised by city system:

Built Environment	**Mobility**
Decarbonization of building stock by 2050 (National Plan)	Electric mobility
Increasing retrofitting	Autonomous vehicles
Smart digital controlling devices	Mobility as a service
	Connectivity (services, intrastructures, etc.)
Energy	**ICTs**
Renewable energy	Data access and Big Data
Local Energy Communities	5G and Smart City applications
Sensors, monitoring and control	Augmented reality, virtual reality, digital twins
EU Green Deal	Inequality in access to ICT devices
Governance	**Socio-economic**
Long-term planning processes	Ageing population
Co-creation processes	Individualism and consumerism
External financing for decarbonisation	Growing population in cities
Institutional and citizenship awareness	

Table 5. City global trends identified in Vitoria-Gasteiz's APIET 2030

The main function of identifying global city trends is to detect the potential opportunities and threats for a city diagnosis, as well as to bear them all in mind when, later in the process, generating the future city scenarios. While identifying those city trends, it is also important to start thinking on our guiding strategic question for the whole process, including a timeframe for this foresight process, i.e. *How can we make our city carbon neutral by 2035? By 2050?* Completing the evaluation of city trends, the identification of plans and actions already committed, the debate about the city interests (i.e., interest in acting upon specific sectors, focus on energy savings/emissions reductions/citizen participation, etc), and the discussion about the local willingness/expectations concerning the deployment of specific-smart solutions within the city (i.e., electric vehicles, heat pumps, solar photovoltaic…) should be also carried out.

In the case of Vitoria-Gasteiz, those trends were contrasted and classified by local stakeholders – city representatives, practitioners, private sector, academia, neighbours' representatives - during an engaging workshop ranking both the relevance and uncertainty of those trends, assessing the potential impact those could have in the future city. Each participant in the workshop was able to vote for the most relevant trend, on one hand, and the

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most uncertain trend on the other hand. The fact of voting 'relevance' points the impact, the strength with which a trend could affect the city; voting 'uncertainty' opens a dichotomy of a two-fold future scenario (what could or couldn't happen in the city if a trend becomes –or not- real in the future).

The figure below shows the result of this exercise in the city of Vitoria-Gasteiz; first, stakeholders voted for each trend regarding its 'relevance' and 'uncertainty'; secondly the facilitators of the workshop transformed that voting into a 2-axes diagram, combining both variables, hence ranking the most interesting city trends to generate different potential future scenarios for the city.

	Global city trend	Code	"Relevance" votes	"Uncertainty" votes
Building stock	Decarbonisation 2050	En1	2	.2
	Building stock retrofitting	En2	13	10
	Smart Devices implementation	En3	0	0
	3D printing	En4	0	1
Sustainable Mobility	E-mobility	Mo1	7	6
	Connectivity	Mo2	0	0
	Autonomous driving	Mo3	0	3
	Mobility as a Service	Mo4	1	0
Governance	Long-term planning	Go1	2	2
	Co-design/ co-creation processes	Go2	4	2
	Supra-municipal funding in climate action	Go3	1	5
	Institutional and citizenship awareness	Go4	16	20
Energy	Renewable energies	En1	11	2
	Local Energy Communities	En2	1	1
	Energy System's monitoring	En3	0	0
	EU Green Deal	En4	4	3
Information & Communication Technologies	Data access	TIC1	0	2
	Virtual Reality, Augmented Reality, Digital Twins	TIC2	0	1
	Smart City Apps and 5G	TIC3	0	0
	Increasing inequalities	TIC4	1	2
Social	Responsible consumption	So1	2	7
	Demographics and aging population	So2	2	0
	Individualism and consumerism	So3	10	8
Others	Telework and reduced commuting	Otro1	3	4
	Active mobility	Otro2	0	2
	Increasing legislation	Otro3	4	3
	Education and leading societal patterns	Otro4	1	1
	Impact of Climate Change	Otro5	2	0
	Industry 4.0	Otro6	2	0
	Globalisation and big capitals attraction	Otro7	3	1

Figure 7. City global trends voted by relevance/ uncertainty in Vitoria-Gasteiz's APIET 2030. Source: SmartEnCity project

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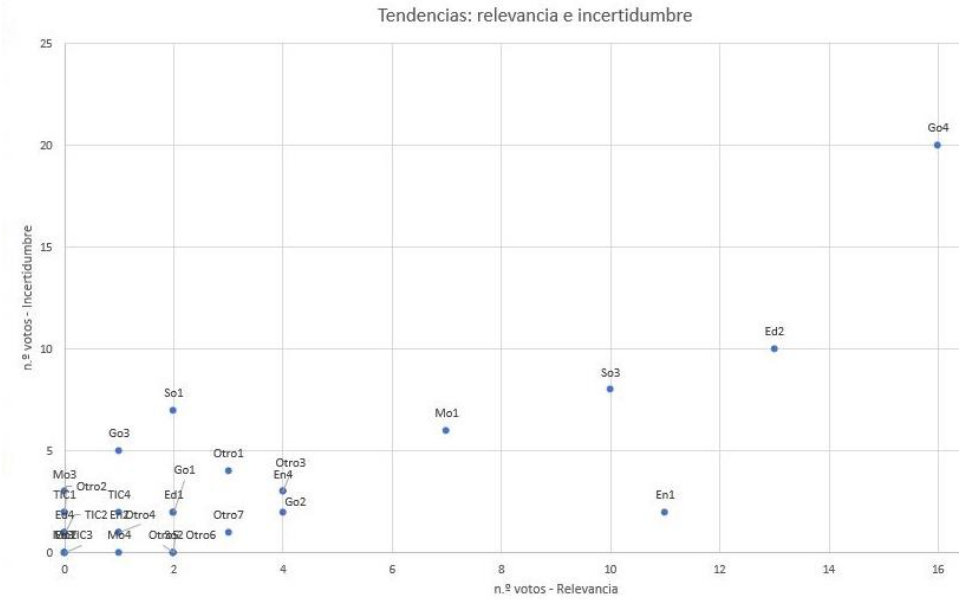

Figure 8. City global trends ranked by relevance/ uncertainty in Vitoria-Gasteiz's APIET 2030. Source: SmartEnCity project

Recommended tools and engagement actions (see Table 3):

- Surveys
- Interviews with experts
- Impact-uncertainty matrix. Some references: Our Scenario Approach (link), Uncertainty Matrix (link)
- Diagnosis workshop (WS0) a diagnosis workshop of prior scenarios

B. City Diagnosis

Once city trends are identified and assessed by local stakeholders, it is time to start with the City Diagnosis. Delving into the "external forces of change" (city global trends), it will be possible to obtain both "Opportunities" and "Threats", following the SWOT analysis logic. At the same time, looking now at the "internal forces of change", the focus points and the inner characteristics of the city, identifying the main "Strengths" and "Weaknesses", again with the SWOT analysis logic. An option is to perform this SWOT analysis for each of the relevant sectors of an energy and decarbonization plan, i.e. built environment, energy generation, mobility, engagement, etc. Alternatively, the PESTLE analysis can be an option as well (Political, Economic, Social, Technological, Legal and Environmental); both methods can provide a comprehensive enough background for city scenarios' generation.

This SWOT analysis will provide a qualitative characterization and diagnosis of the city, which would ideally have to be complemented by quantitative data. In this sense, the energy characterization of the city can be fed by the data gathered from municipal databases, surveys, inputs from private companies and local stakeholders, or even interviews with municipal technical staff. Along this data gathering process, the definition of energy indicators should

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also help to identify the key city systems with more energy-savings and emissions-savings potential.

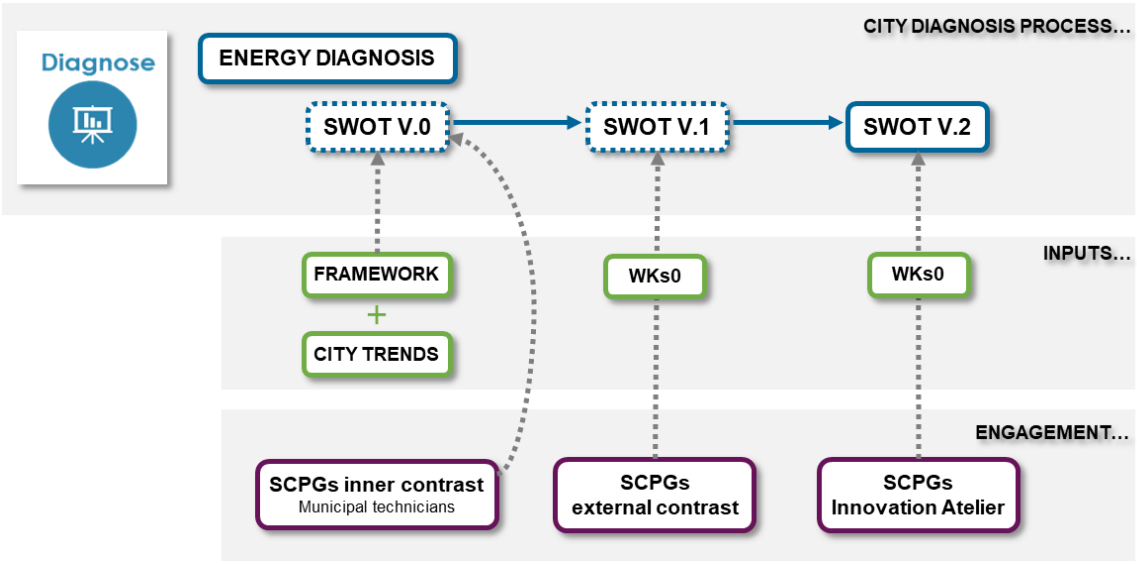

Figure 9. Suggestion for a city diagnosis process. Source: own elaboration

Regarding the City Diagnosis process, the steering group (local SCPG in the case of ATELIER cities) can perform a generation workshop (Workshop 0, a diagnosis workshop of prior scenarios). This can be helpful for establishing working groups, introducing local stakeholders to the strategic process to enrich the results of the City Diagnosis. 'Workshop 0' can be designed to frame both 'city global trends' and 'city diagnosis' processes. This event can also be a good opportunity to set out and communicate the main ambitions of the strategic process as well as the timeframe for those ambitions (2035/ 2050). Moreover, all qualitative and quantitative data that can be extracted from the global city trends and city diagnosis assessments, provides very relevant and helpful insights to feed into the discussion in the following workshops as well as for the definition of scenarios to be generated in the next steps.

Figure 10 suggests how this city diagnosis process can be structured, including the identification of global city trends described in the previous section. Among the tasks carried out in the WP2 in Task 2.1 the development of the context framework has been developed for each partner city. These City context analysis were structured in 3 parts:

- A survey was launched and answered by the cities in order to know their expectations; then
- City plans and other relevant documents were identified and an extensive analysis of the most interesting ones have been carried out; and finally
- Conclusions were drawn for each city, relating its context to the methodology developed throughout the WP2 (Cities4ZERO) in order to know how to adapt it to the specific circumstances of each city.

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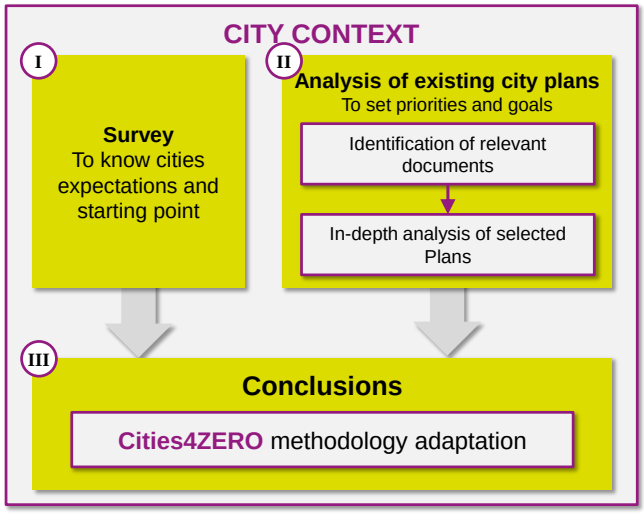

Figure 10. Method to analyse the city context. Source: ATELIER D2.1

From this analysis, opportunities and considerations were analysed in order to diagnosis the city starting point and a workplan for the activities that can be developed, or the city would need more, were proposed.

Recommended tools and engagement actions (see Table 3):
- Interviews with experts or municipal technicians
- SWOT analysis
- PESTLE analysis
- Diagnosis workshop (WS0) a diagnosis workshop of SWOT analysis

C. City Scenarios

Scenarios can be defined as "a set of alternative contexts for exploring different ways that the future may unfold", i.e. they are used "to characterize an envelope of expected future conditions or quantify savings potentials from policy, technology, or behavioural changes" (Ghanadan and Koomey, 2005)[15]. Hence, energy scenarios are a powerful instrument to portray future visions of the city, which should support the drafting of plans and strategies. By raising and assessing different forward-looking views of the city, local authorities can act upon the energy-relevant areas of the city guided by the results offered by the scenarios.

As proposed by Börjeson et al (2006)[16], scenarios can be classified into three categories based on the question to be answered: predictive scenarios ("What will happen?"), explorative scenarios ("What can happen?"), normative scenarios ("How can a specific target be reached?"). The first type of scenarios would be close to a forecast approach, while the other two would fit within the foresight concept. Table 6 describes the differences between the types of scenarios: their approaches, timeframes and support techniques.

[15] R. Ghanadan, J.G. Koomey, Using energy scenarios to explore alternative energy pathways in California, Energy Pol. 33 (2005) 1117–1142, https://doi.org/ 10.1016/j.enpol.2003.11.011
[16] From L. Börjeson, M. Höjer, K.H. Dreborg, T. Ekvall, G. Finnveden, Scenario types and techniques: towards a user's guide, Futures 38 (2006) 723–739, https://doi.org/ 10.1016/j.futures.2005.12.002.

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Scenario type	Generating techniques	Modelling techniques	Quantitative/Qualitative	Time-frame
Predictive	Surveys	Times series analysis	Typically quantitative	Short
	Workshops	Explanatory modelling		
	Original Delphi method	Optimising modelling		
Explorative	Surveys	Explanatory modelling	Typically qualitative	Long
	Workshops	Optimising modelling		
	Modified Delphi method			
Normative	Surveys	Backcasting Delphi method	Qualitative and quantitative	Long to Very long
	Workshops	Optimising modelling		

Table 6. Scenarios' classification overview (Börjeson et al, 2006)

One of the advantages of using scenarios is that they allow a vast range of eligible options, from the conception of conservative visions which may preserve past trends, to the proposal of alternative futures that may include structural changes in the system - thus breaking previous paths. On the contrary, it should be noted that scenarios are not forecasts, thus they deal with a high degree of uncertainty which must be considered when evaluating their results. Table 7 compares the approach contrast between forecasts and scenarios.

	Forecasts (What is likely?)	Scenarios (What could be?)
Approach	Rational focus on analysis and outcomes	Focus on process, strategy, and learning
Objective	To develop most likely pathway and characterize uncertainty	To develop a number of insightful pathways that explore uncertainties
Methods	Analytical models and driver variables	Qualitative stories evaluated by models
Treatment of uncertainty	Probabilistic methods, statistics, and transparency of assumptions	Exploration of critical uncertainties, and separation of predetermined and uncertain elements in crafting stories
Important actors	Reliance on experts, state and national planning agencies	Group facilitators, strategists, problem-solvers

Table 7. Differences between forecasts and scenarios approach (Ghanadan and Koomey, 2005)

Scenarios' development and their integration in energy planning has been reviewed by numerous authors. Drysdale et al (2020)[17] remarked the importance of "developing strategic visions and scenarios for a decarbonised energy system" and argued that strategic energy

[17] Maya-Drysdale, D.; Krog Jensen, L.; Vad Mathiesen, B. Energy Vision Strategies for the EU Green New Deal: A Case Study of European Cities. Energies 2020, 13, 2194. https://doi.org/10.3390/en13092194

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planning should include “long-term decarbonisation targets, holistic energy system thinking, and retention of energy scenarios”. Benedict (2017)[18] assessed the usefulness of energy scenarios in policy-making: the authors proposed a scenario planning process and highlighted the importance of critical events (which can be classified by both uncertainty and impact) in scenario modelling. In the study of Moallemi and Malekpour (2018)[19] both qualitative participatory and quantitative modelling approaches are integrated in order to support policy analysis in the long-term planning of energy transitions. Mirakyan and De Guio (2013)[20] proposed a methodology for integrated energy planning which included participatory processes to create a shared vision and modelling approaches to generate scenarios. Regarding scenario modelling, a study from the World Bank (2009)[21] a set of energy demand models for policy formulation. A similar review was carried out by Ferrari et al (2019)[22] for tools which could be used for energy planning at urban level. Finally, examples of the use of scenario storylines to explore future energy systems under different perspectives can be found at world (World Energy Council, 2021)[23], national (nationalgridESO[24](Ghanadan and Koomey, 2005), and urban level

Concerning the Cities4ZERO methodology, this envisages the generation of urban energy scenarios through a participatory process in which local stakeholders develop qualitative storylines by merging key aspects related to the urban energy system. These narratives are then quantitatively modelled considering local stakeholders and experts’ feedback discussed during the workshops. The City Vision is thus created based on the evaluation of a set of future portraits of the urban energy system. The application of scenarios for the development of the City Vision is shown in Figure 6.

On a first approach, the general future framework of the city is discussed considering the global city trends assessed in the previous steps (WS0). This first draft establishes a qualitative context, towards which alternative scenarios are generated. They will be subsequently shaped with more detail through the assessment of different pathways leading to this desired future vision.

Prior to the alternative scenarios conception, a Business as Usual (BaU) scenario is developed. This first scenario raises a conservative and trend-continuing vision of the city, serving as a baseline for the further development of alternative scenarios. The BaU captures

[18] Barry A. Benedict, Benefits of Scenario Planning Applied to Energy Development, Energy Procedia, Volume 107, 2017, Pages 304-308, ISSN 1876-6102, https://doi.org/10.1016/j.egypro.2016.12.157

[19] Enayat A. Moallemi, Shirin Malekpour, A participatory exploratory modelling approach for long-term planning in energy transitions, Energy Research & Social Science, Volume 35, 2018, Pages 205-216, ISSN 2214-6296, https://doi.org/10.1016/j.erss.2017.10.022

[20] Atom Mirakyan, Roland De Guio, Integrated energy planning in cities and territories: A review of methods and tools, Renewable and Sustainable Energy Reviews, Volume 22, 2013, Pages 289-297, ISSN 1364-0321, https://doi.org/10.1016/j.rser.2013.01.033

[21] Subhes C. Bhattacharyya Govinda R. Timilsina (2009) Energy Demand Models for Policy Formulation. A Comparative Study of Energy Demand Models, http://documents1.worldbank.org/curated/en/800131468337793239/pdf/WPS4866.pdf

[22] Simone Ferrari, Federica Zagarella, Paola Caputo, Marina Bonomolo, Assessment of tools for urban energy planning, Energy, Volume 176, 2019, Pages 544-551, ISSN 0360-5442, https://doi.org/10.1016/j.energy.2019.04.054

[23] World Energy Council - https://www.worldenergy.org/transition-toolkit/world-energy-scenarios

[24] NationalgridESO, 2021 - https://www.nationalgrideso.com/future-energy/future-energy-scenarios

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the city's past tendencies and historical patterns, including committed actions and policies, but without proposing further changes. The development of this scenario may help towards the identification of the challenges that the city should address in the alternative scenarios[25].

During WS1, local stakeholders devise the alternative scenarios' scripts. As shown in Figure 11, by weighting different relevant aspects of the city energy system, the alternative scenarios' scripts are created, based on the city's expectations, needs or requirements regarding the proposed key topics. The prioritization of the key areas in the different scenarios developed can be supported too by the definition of indicators during the city diagnosis, which should help towards the identification of the city's critical points in this step.

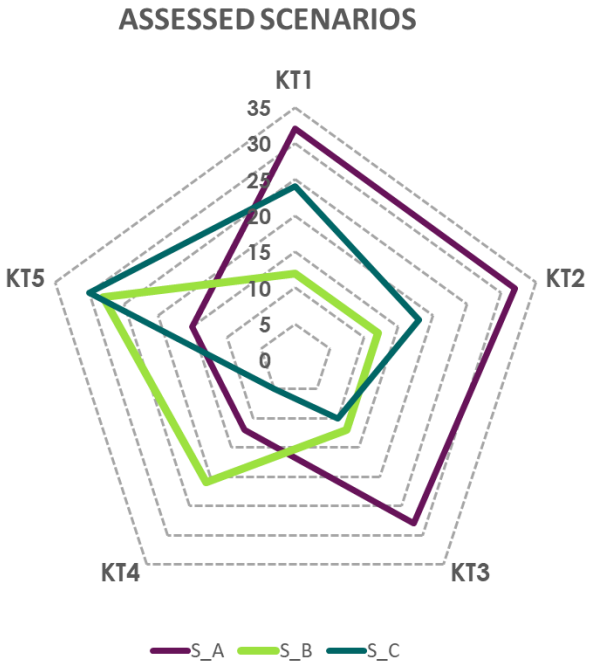

Figure 11. Weighting of key topics in four different alternative scenarios. Source: own elaboration

Alternative scenarios are developed led by the previously conceived scripts. Depending on the weighting of the key topics, each scenario is implemented by modelling in detail the measures associated with each topic. Although guided by the qualitative views defined in WS1, the final building of the scenarios should also consider technical criteria: taking into to account the city's reality and assessing the actual options and potentials for the implementation of specific technological solutions. The city diagnosis is an important step which may contribute to this task. Last but not least, built scenarios should be (figure below):

[25] Impact assessment of measures on PED-scale (Task 9.3) will be assessed by comparing the performance indicators in reference alternatives (BAU from WP 2) and the performance indicators in Task 9.2.

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Figure 12. Scenarios' characteristics. Source: Based on (Maack 2001, 73)

Once the alternative scenarios have been modelled, their results can be compared. During WS2, local stakeholders decide, based on multi-criteria assessment, which scenario (or scenarios combination) may conform the city's master scenario. This scenario represents the agreed City Vision upon which the city's Roadmap and further Action Plan are developed.

Overall, these scenarios' workshops must be developed on the basis of exploring potential policy interventions, including experts and energy modellers, so the implications on the socio-ecological system can be assessed. A participatory modelling approach is suitable, so workshop participants can ask questions to the modellers, obtaining real-time answers, hence enriching their scenario generation process (Bond et al, 2015)[26].

In the table below, there are some recommended modelling tools.

Tool	Time horizon/Time step	Included energy services	Analysis approach
Balmorel	Multiple years/Hourly	Electricity, Heat	Optimization
City Energy Analyst	One year/Hourly	Electricity, Heat, Cooling	Simulation
EnergyPLAN	One year/Hourly	Electricity, Heat, Cooling, Transport	Simulation

[26] Alan Bond, Angus Morrison-Saunders, Jill A.E. Gunn, Jenny Pope, Francois Retief, Managing uncertainty, ambiguity and ignorance in impact assessment by embedding evolutionary resilience, participatory modelling and adaptive management, Journal of Environmental Management, Volume 151, 2015, Pages 97-104, ISSN 0301-4797 https://www.sciencedirect.com/science/article/pii/S0301479714006094?via%3Dihub

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Tool	Time horizon/Time step	Included energy services	Analysis approach
EnergyPRO	Multiple years/Hourly	Electricity, Heat, Cooling	Optimization
LEAP	Multiple years/Yearly	Electricity, Heat, Cooling, Transport	Simulation (& Optimization if combined with OSeMOSYS)
RETScreen	One year/Monthly	Electricity, Cooling	Simulation
TIMES	Multiple years/Hourly	Electricity, Heat, Cooling, Transport	Optimization
TRNSYS	Multiple years/Hourly	Electricity, Heating, Cooling	Simulation & Optimization

Table 8. Review of urban energy scenarios modelling tools (based on Ferrari et al. (2019)[27], Beuzekom et al. (2015)[28], Connolly et al. (2010)[29])

D. City Vision generation.

As mentioned before, after the scenario's definition, each Lighthouse and Fellow city will produce a City Vision for 2050 on the energy transition that delivers the long-term commitment of the city to further implementation and upscaling of PEDs beyond the lifetime of ATELIER. The City Vision supports a seamless city transformation from planning (Roadmap) to implementation (Action Plan) and further upscaling and replication.

In the case of ATELIER, each City Vision will have different characteristics and ambitions, but it must help all of them to evolve to a more decarbonised energy system. For instance, most of current SECAPs are looking to meet commitments by 2030, while other more long-term oriented foresight processes can look at processes until 2050. In this sense, the ATELIER City Vision will work as the general statement that will represent the city at the end of that selected timeframe, which will be at the same time as the steering message that will guide the strategic planning process towards the definition of specific actions that will lead the city to such vision.

In practical terms, the City Vision for 2050 is steered by the local SCPG (see D2.2. Report on Smart City Planning Groups), led by the city, involving representatives from different departments (energy, mobility, spatial / urban planning), industries (such as the local real estate developers, construction companies, network operators, utility companies, etc.), academy (RTOs, universities) and civil society (NGO's, citizen groups, etc.). As a cross cutting element, stakeholder participation throughout the process not only provides useful insights,

[27] Ferrari, S., Zagarella, F., Caputo, P., Bonomolo, M., 2019. Assessment of tools for urban energy planning. Energy 176, 544–551. https://doi.org/10.1016/j.energy.2019.04.054

[28] Beuzekom, I. Van, Gibescu, M., Slootweg, J.G., 2015. A review of multi-energy system planning and optimization tools for sustainable urban development. 2015 IEEE Eindhoven PowerTech. https://doi.org/10.1109/PTC.2015.7232360

[29] Connolly, D., Lund, H., Mathiesen, B. V., Leahy, M., 2010. A review of computer tools for analysing the integration of renewable energy into various energy systems. Appl. Energy 87, 1059–1082. https://doi.org/10.1016/j.apenergy.2009.09.026

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but promotes mutual learning between different actors, stimulates community participation, and creates ownership of initiatives deployed.

To reach ATELIER City Vision, cities should:

- Establish a high-level strategic planning based on a comprehensive diagnosis of the city, incorporating a comprehensive understanding of global and local trends that generate changes;
- Establish through the SCPGs a participatory methodology that allows the participatory development of the Roadmap for urban decarbonization;
- Achieve a high degree of involvement of all agents (local and regional) in each city, ensuring the development of a vision that is truly rooted in the specific context of each city and that allows the empowerment of all of them
- Promote the integration of developing countries as a key element in urban decarbonization

In practice, in order to achieve the City Vision, different workshops and discussing groups are proposed within guidance actions based on collaborative ideation methodologies[30] or guidance. The relevant aspects when elaborating this type of work dynamics have been mentioned in table 4, these are:

- Develop a preferred vision, summarising the scenarios identified with the aim of reach an agreement, a common vision
- Move to strategic planning, answering these questions: What present-day decisions should we make to shape the outcome in the preferred direction, enhancing the desired future or taking actions to prevent non-desirable futures? What are the most important milestones?
- Draw conclusions on the main results of the (previous) workshop

[30] Some of these existing guides or toolkits are:
- Vision workshop toolbox for inspired collaboration on climate neutrality (link)
- Tools for Futures Thinking and Foresight Across UK Government (link)
-

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5. What after 2050 Vision? The way towards an Action Plan

Once the city has set the long-term vision, another process is needed to incorporate the goals of the City Vision and its specific strategic lines and turn them into concrete actions under the city planning dynamics. Therefore, the **City Vision 2050** will act as the umbrella or framework that cities, their politicians and urban planners will take as reference when defining policies, actions or plans from now until 2050 to ensure target accomplishment. So, it is of utmost importance that the City Vision 2050 is accepted and approved by the city representatives in a Municipal Plenary, ensuring its inclusion in the political agenda avoiding inaction at implementation level.

The City Vision will be complemented with a **Roadmap or Pathway**, which sets intermediate milestones by means of political commitments throughout the different years until reaching those established in 2050. Thus, by translating this political commitment defined under the different steps of the Roadmap in practical measures and specific actions (Action plans), will ease the attainment of the long-term objectives.

An **Action Plan** must clearly define how to cover the objectives assigned for that period in the Roadmap of the City Vision. An effective Action Plan provides a solid framework to organize, track and review work development. It collects the sequence of steps that must be taken, or activities that must be accomplished, for a successful strategy implementation. The vision could be deployed through many kinds of Action Plans, some of them well-known and structured under existing initiatives, such as SECAPs or SUMPs, or Climate adaptation and mitigation plans among other possible city strategies, depending on the City Vision stablished some of them will fit better than other to address its objectives in the short therm.

Thus, the process to develop an Action Plan starts from the creation of the Roadmap that establishes strategic objectives progressively over the years until that long-term goal. And then, objectives and actions are set in the short and medium-term within the Action Plan, see Figure 13.

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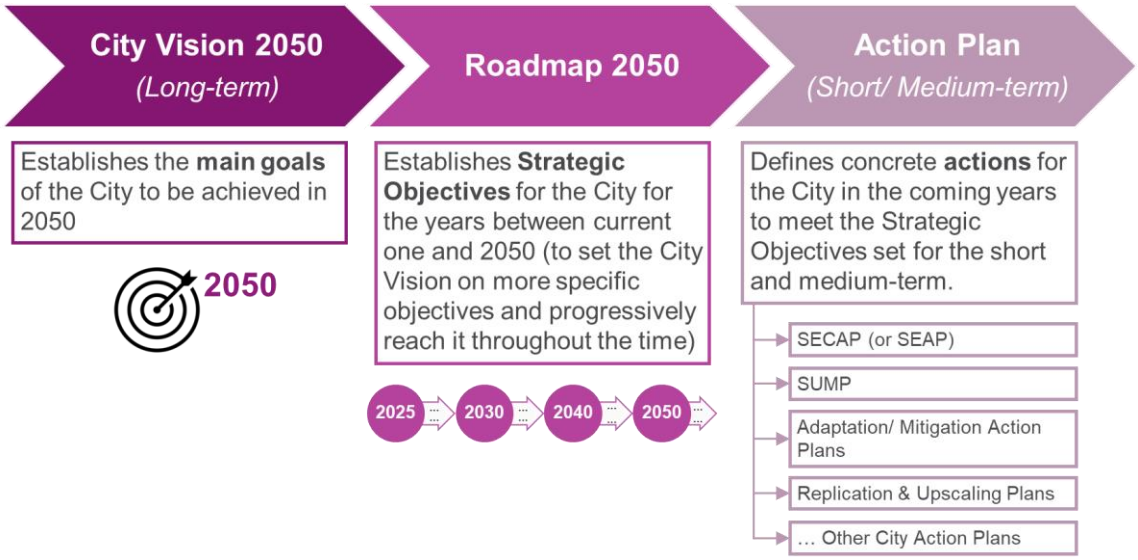

Figure 13. From City Vision to Action Plan. Source: own elaboration

The **key to succeed in an Action Plan development**[31] is that it should:

- Be a collaborative document: Involvement of major political groups, including the mayor, other high-level politicians, different stakeholders and the general public in preparing the Action plan is critical. The already stablished Smart City Planning Groups – SCPG in the cities, could work on the Action plans definition
- Be agreed by all the stakeholders involved: a political approval of the implementation phase by the city council will legitimize the process.
- Have specific, measurable, attainable, resourced and time-bound targets
- Include clear and objective success criteria, which will determine the extent to which each target has been achieved
- Have clear procedures for monitoring and evaluating
- Have roles/responsibilities clearly defined
- Have approaches to implementing the change/improvement clearly defined
- Include an approximate time or cost
- Be reviewed and evaluated periodically to inform future planning

The Action Plan provides a solid framework to prioritise, track and review work development after implementation (see Figure 14).

[31] D1.20 Urban Regeneration Model. REMOURBAN Project. GA 646511 (http://www.remourban.eu/technical-insights/deliverables/urban-regeneration-model.kl)

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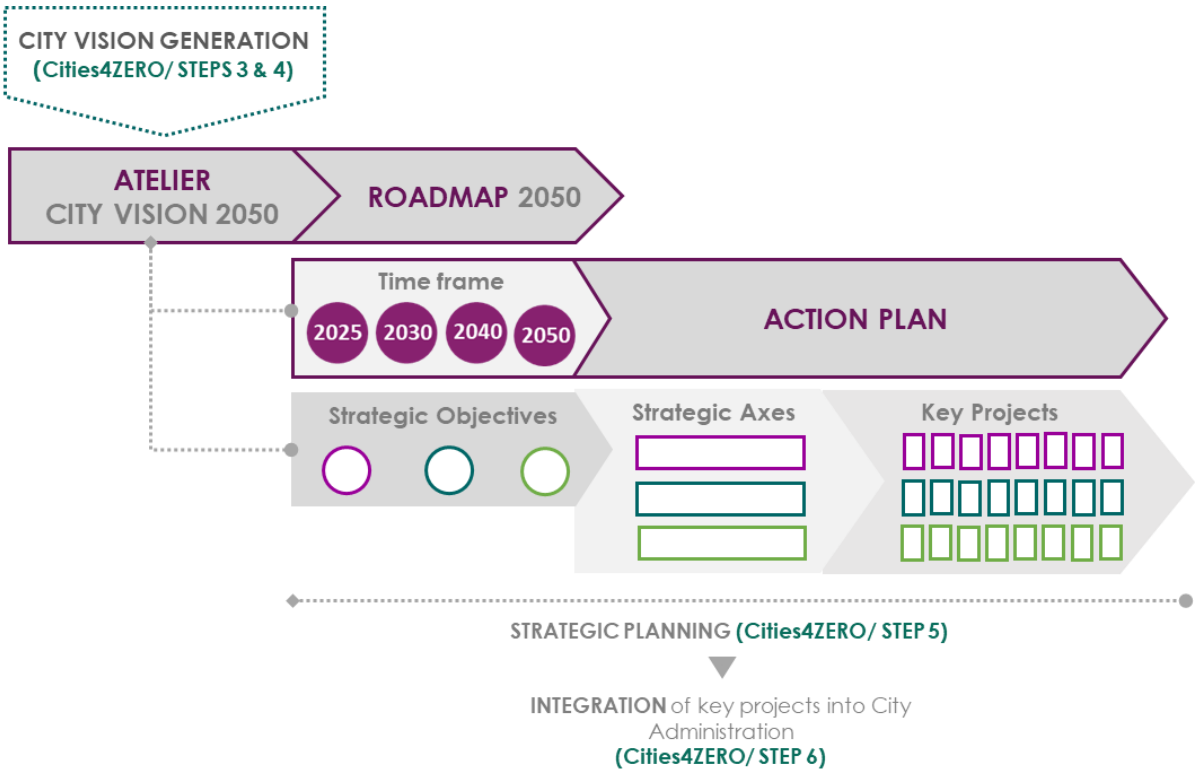

Figure 14. Development of an Action Plan from a 2050 City Vision based on Cities4ZERO approach. Source: own elaboration based on Urrutia (2020)

As it was already stated in *D2.1 Planning framework,* all ATELIER cities, except Krakow, currently have a SEAP approved, as an Action Plan with which accomplish 2020 energy targets. So, the SECAP is one of the potential Action Plans that ATELIER cities can applied to undergo City Vision targets in the medium term by detailing adaptation and mitigation actions and strategies in response to the impacts of Climate Change.

SECAP is framed within the Covenant of Mayors (CoM) initiative from the EC, to which cities can join by signing to commit to implementing EU climate and energy objectives; and it has been in many cases the only tool to manage and act on the urban energy and climate field. The time horizon for the SECAP is 2030, and although it can cover a longer period, in this case it should contain intermediate values and objectives for the year 2030. Table 8 below summarizes the SECAP process throughout the main steps to be taken for its definition and in the third column the activities where ATELIER project supports it because they are being addressed (cells in green) or will be addressed in the future (cells in blue).

STEP		CoM Main actions description	ATELIER'S activities support
INITI	**Political commitment and sign the CoM**	▪ Make the initial commitment and sign the CoM ▪ Encourage the policy-makers to take action	Already covered in WP2 through the Smart City Planning

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STEP		CoM Main actions description	ATELIER'S activities support
	Mobilize all municipal departments involved	▪ Allocate human resources ▪ Adequate structure in the administration to ensure the collaboration amongst different departments	Groups (SCPG) set by each city
	Build support from stakeholder	▪ Impulse the stakeholders' participation ▪ Prepare an inventory of relevant stakeholders	
PLANNING	**Assessment of the current framework:** ***Where are we?***	▪ Conduct the initial assessment ▪ Collect necessary data ▪ Elaborate the **CO_2 emissions inventory**	To be done in the WP2 framework (modelling and development of energy scenarios)
		▪ Elaborate the **climate risks and vulnerabilities assessment**	To be potentially supported under **Task 2.5**
	Establishment of the vision: ***Where do we want to go?***	▪ Establish the **long-term vision** and **objectives** that support the vision	To be done in the WP2 framework: **City Vision 2050**
	Elaboration of the plan: ***How do we get there?***	▪ **Define the priorities**, in line with the vision previously defined ▪ **Elaborate the plan**: - **Define policies and measures** in line with the vision and objectives - Establish **budget** and **financing sources** and mechanisms - **Timing** - **Indicators** - **Responsibilities**	Specific for an Action Plan. In ATELIER: ▪ **Replication and Upscaling** plans (WP6) ▪ Support in update SEAP to **SECAP** or in development of SECAP (Task 2.5)
	Plan approval and submission	**Approve the plan** and the necessary budgets (at least for the first year/s)	

Table 9. SECAP process: main steps (source: JRC[32])

Depending on the framework in which the Action Plan is addressed (e.g. SECAP, SUMP, Replication and Upscaling plans, Adaptation or Mitigation strategies among others), the process slightly differs. In Table 8, a summary of the main steps of the most commonly Action Plans applied by ATELIER cities is presented as an initial introduction of the way that cities will deal with this stage under Task 2.5 after the City Vision definition.

[32] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC112986/jrc112986_kj-na-29412-en-n.pdf

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6. Amsterdam´s methodology City Vision / Roadmap 2050

6.1. Amsterdam as ATELIER front runner city.

Amsterdam approved in spring 2020 The Amsterdam Climate Neutral Roadmap 2050. This Roadmap describes the City's ambitions – Amsterdam's City Vision in ATELIER terminology - its long-term vision regarding Amsterdam's energy transition and proposed actions for the short term. The City will work closely with residents, businesses and organisations to make this change, a process during which the city will experiment, collect data, evaluate and learn. The Roadmap details the steps and measures needed to arrive at the targeted CO2 reduction for built environment, mobility, electricity and port & industry.

The fact that Amsterdam, as a lighthouse city in ATELIER project, has already developed their city ambition/vision following their own method is a good opportunity to enrich proposed process for city vision creation in other ATELIER cities. Therefore, section 6.2 explains the process followed by Amsterdam to create their Climate Neutral Roadmap 2050 and provides valuable tips and lessons that will help ATELIER cities in their city vision creation process. Moreover, section 6.3 connects the methodology followed by Amsterdam and the steps of the Cities4ZERO methodology. This work has been done with two objectives. Firstly, to identify the steps where the Cities4ZERO method can be enriched with the lessons coming from Amsterdam experience. Secondly, to identify how the Cities4ZERO methodology can also complement and provide support in some points of Amsterdam on-going activities.

Before analysing the process followed by Amsterdam, it is important to summarize the highlights of *The Amsterdam Climate Neutral Roadmap 2050.*

Amsterdam wants to reduce CO2 emissions by 95% in 2050 compared to 1990 and make Amsterdam free of natural gas by 2040. The intermediate step to 2050 will be 55% less CO2 emissions by 2030. The city wants to focus on energy savings and generation of sustainable energy. The document describes the vision's most important ingredients and the strategy needed to jointly start the transition from fossil fuels to renewable energy and to keep it going.

Timeline 2020-2030	Vision 2030 and 2050	Base year 1990	55% CO2 reduction in 2030	95% CO2 reduction in 2050	4 Sectors covered

Figure 15. Amsterdam Climate Neutral Roadmap 2050 main features. Source: City of Amsterdam

In addition to the Amsterdam Climate Neutral Roadmap a strategy on *Circular Amsterdam* was developed and adopted in 2020. The two approaches complement one another. The Amsterdam Climate Neutral Roadmap focuses on reducing carbon emissions in Amsterdam, and the circular economy programme focuses on cutting the use of primary raw materials, which will have also the effect of reducing carbon emissions beyond Amsterdam.

Moreover, Amsterdam also wants to be a city that copes well with the effects of climate change, such as flooding, increasing periods of hot weather and drought, and changes to biodiversity.

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As it was mentioned before, following sections explain Amsterdam´s ambitions development process, collects valuable tips and lessons learnt for the ATELIER´s cities and compares the work done with Cities4ZERO methodology.

6.2. Amsterdam Climate Neutral Roadmap 2050 development process

Amsterdam Climate Neutral Roadmap 2050 development process can be divided in 4 main elements:

1) **City participation**, which had the **Climate agreement** as a result.
2) **Research themes**, which provided the basis to support the analysis or the so-called **Background roadmap**.
3) **Internal stakeholder engagement**, whose conversations guided the correct development of the process.
4) **Data collection and analysis** by the evaluation team, which had as a result the **Climate Budget** that provides the reference values for **planning the Roadmap**.

These elements are not necessarily listed in chronological order. In practice they overlap and enrich each other via iterative interactions, as it is summarized in Figure 16.

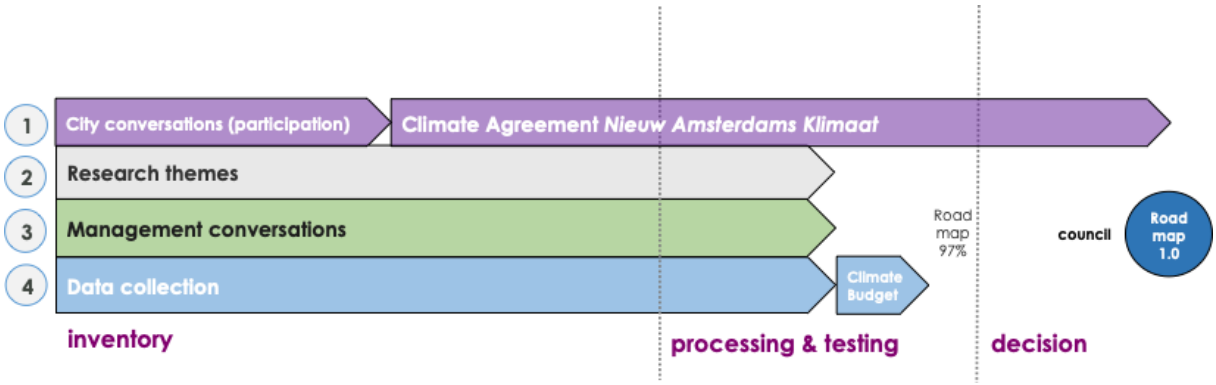

Figure 16. Main elements of the Amsterdam Climate Neutral Roadmap 2050 development process. Source: City of Amsterdam

Amsterdam Climate Neutral Roadmap 2050 formally development process started in 2018 and presented the first version of the Roadmap in spring 2020. Figure 17 explains the timeline approximately followed in the creation process. The 4 main elements previously listed are represented in this figure and have been divided in steps to understand better the process. After the detailed timeline, actions taken, tips & lessons learnt and results from each of the 4 main elements are described.

It is important to note that the outcome and process described in this section is not 'the' model of Amsterdam but the representation and findings of the evaluators. These are based on the different reflections, opinions and feedback of those involved.

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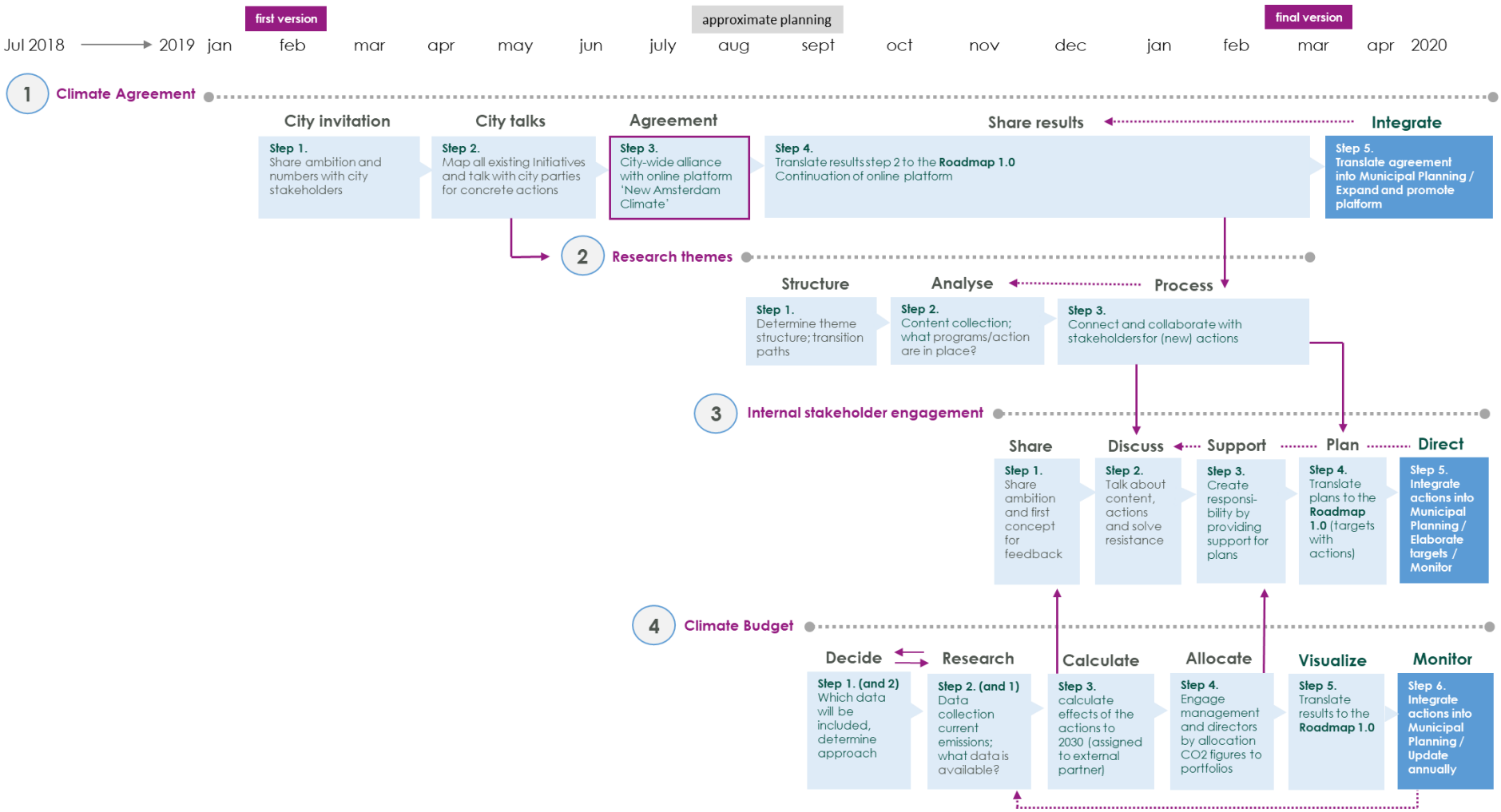

Figure 17. Amsterdam Climate Neutral Roadmap 2050 main elements, actions and approximate timeline. Note that actions could be taken in different orders, could be recurring and some took months and others just a week. Source: City of Amsterdam

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6.2.1. Climate Agreement (city engagement)

Citizens engagement activities were active during the whole Roadmap development process. One of the main results of these activities was the 'Climate Neutral Roadmap: Invitation to the city' of January 2019. This Roadmap outlines what the city considers important and why. The invitation to the city kicked off an intensive process to investigate and make agreements with residents, companies and institutions on how to achieve this enormous social transition.

The 'Climate Neutral Roadmap: Invitation to the city' shows that the energy transition is an opportunity, offers opportunities and that the city is already on the move. Anyone can participate; young and old, residents and entrepreneurs. This requires movement from above and below. Amsterdam desperately needs the smaller actions and projects of individual citizens as well as groups of people. For good ideas that require a large financial contribution, the climate fund of Amsterdam can help.

Amsterdam Climate Agreement, resulted from the process of city engagement, has been concluded and an online platform nieuwamsterdamsklimaat.nl (Figure 18) has been launched with over 200 initiatives for a sustainable city.

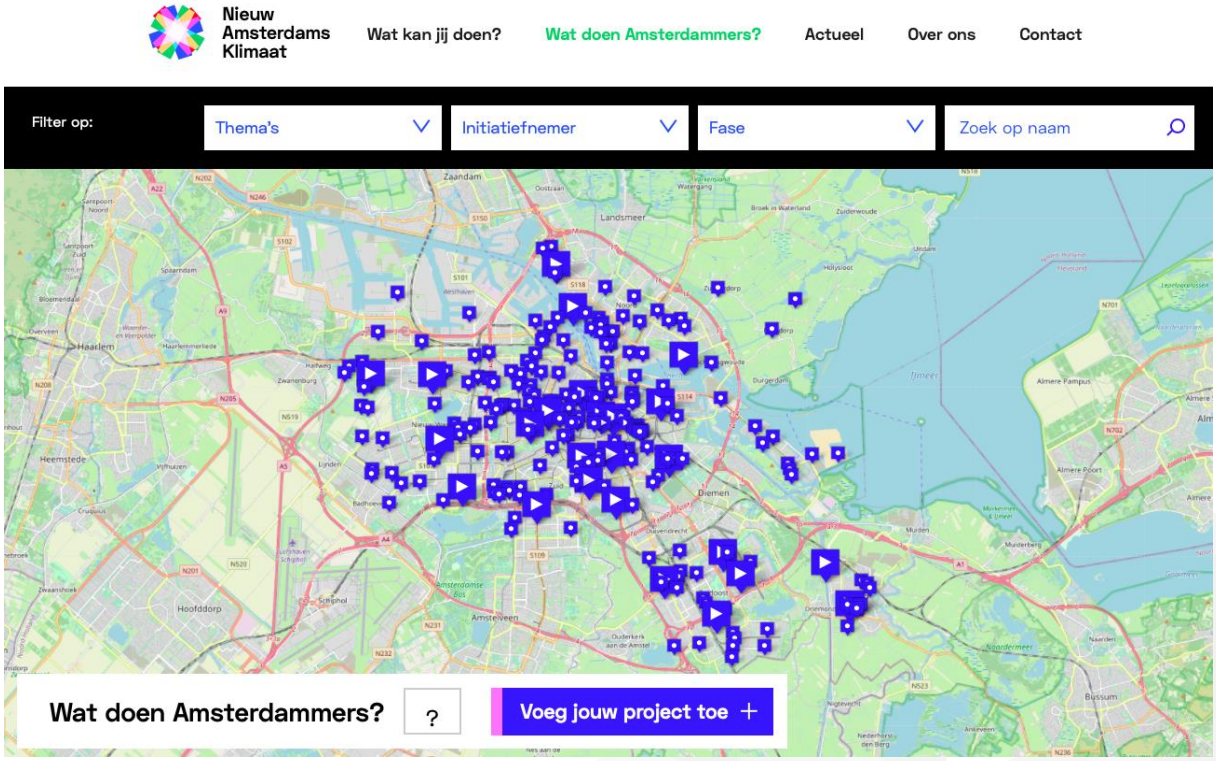

Figure 18. Amsterdam Climate Agreement online platform. Source: City of Amsterdam

Figure 19 collects the actions taken in Amsterdam Roadmap development process for citizen engagement and Figure 20 collects the tips and lessons learnt to be considered in this kind of activities.

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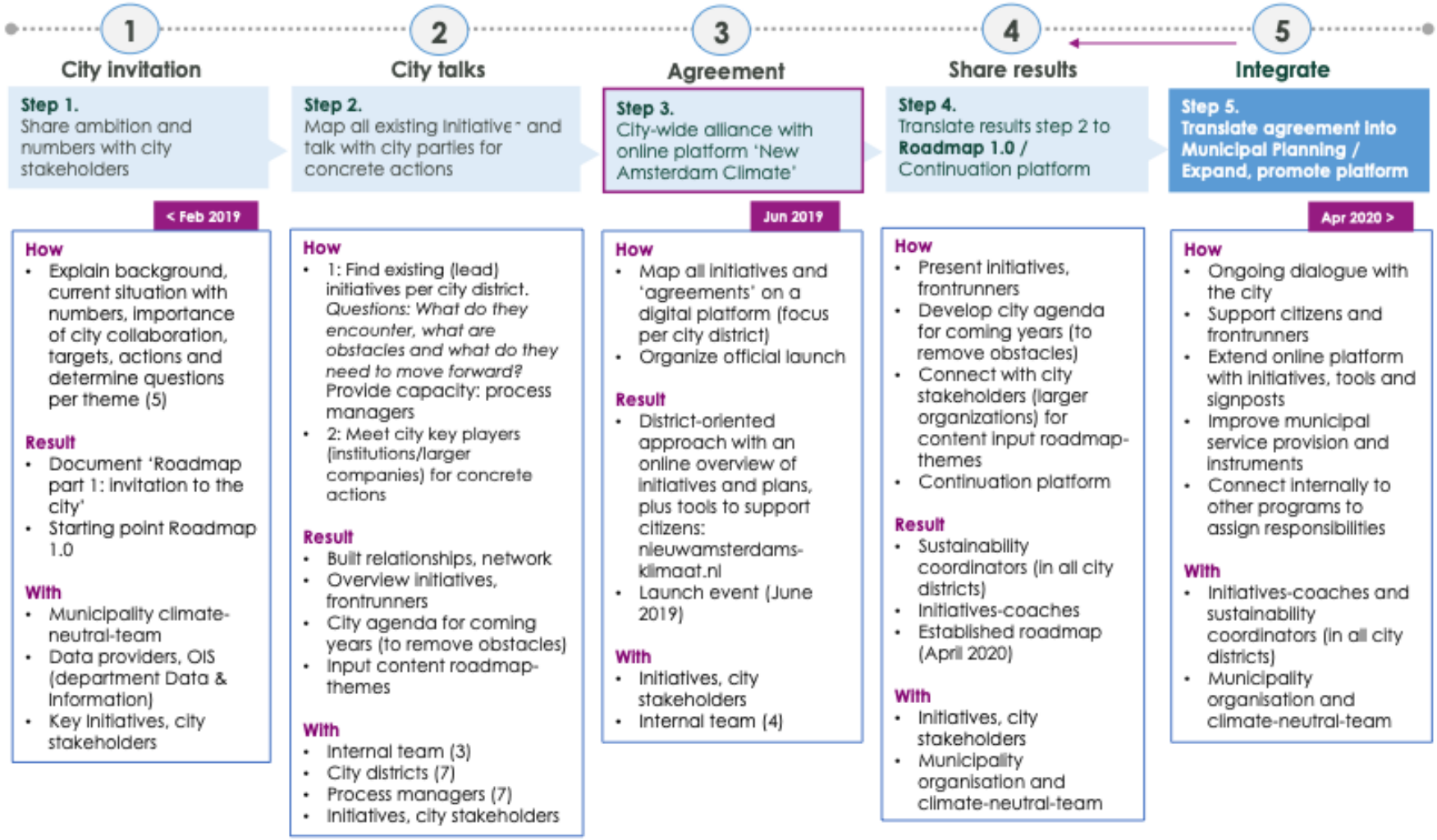

Figure 19. City engagement - actions taken. Source: City of Amsterdam

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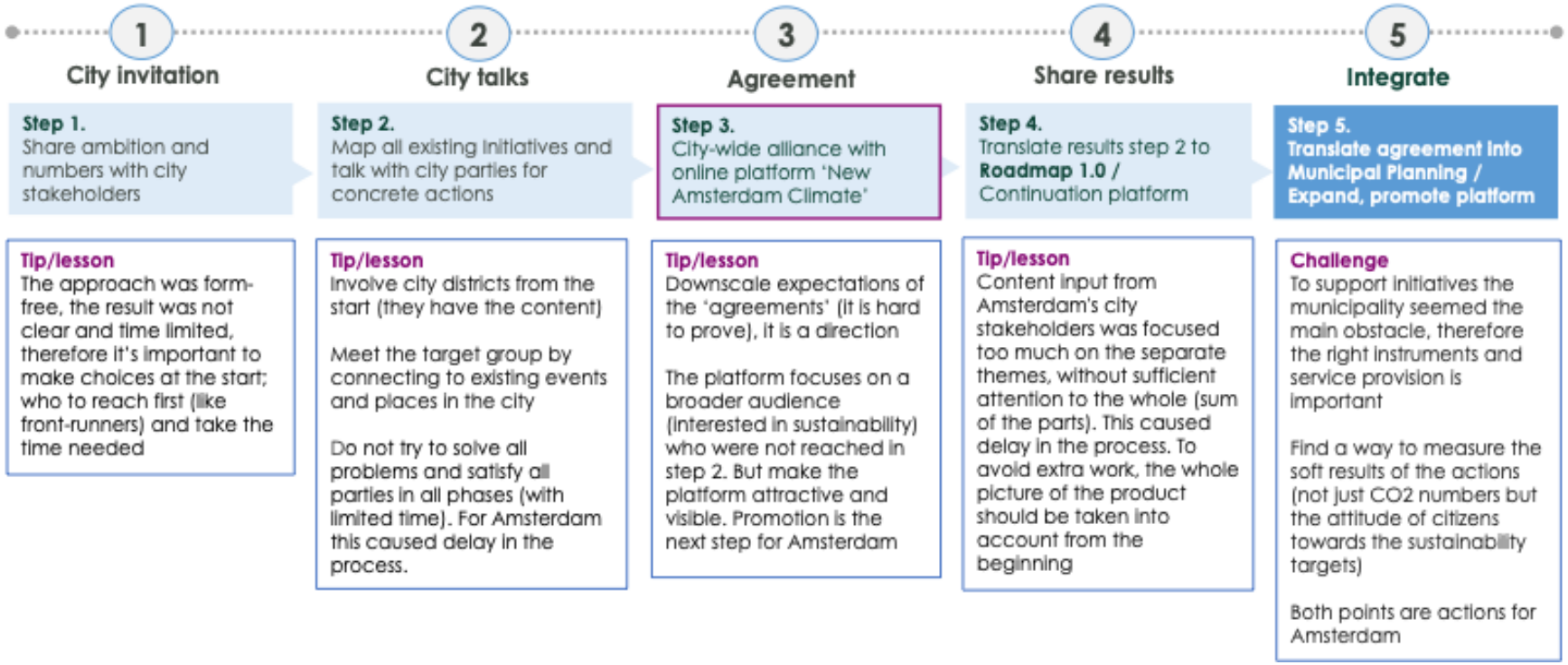

Figure 20. City engagement - tips & lessons. Source: City of Amsterdam

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6.2.2. Background Roadmap (research and elaboration themes)

Amsterdam wants to belong to the group of front-runners with large ambitions. One of them is the energy transition of which the municipality is the director. Also, the city focuses on the reuse of raw materials with natural gas-free neighborhoods, environmentally-friendly generation of electricity and heat, far-reaching energy savings and emission-free traffic.

The councilor for sustainability is the client of the Climate Neutral Roadmap. With the title 'A new spring and a new sound', the city council established the coalition agreement for the administrative period 2018-2022.

As stated in previous section (6.1.1), the invitation to the city kicked off an intensive process to investigate and make agreements with residents, companies and institutions in defined themes. The draft version of the Roadmap was widely shared with partners in the city and supplemented by the many responses received. The process actions taken in this element are overlapping with the others.

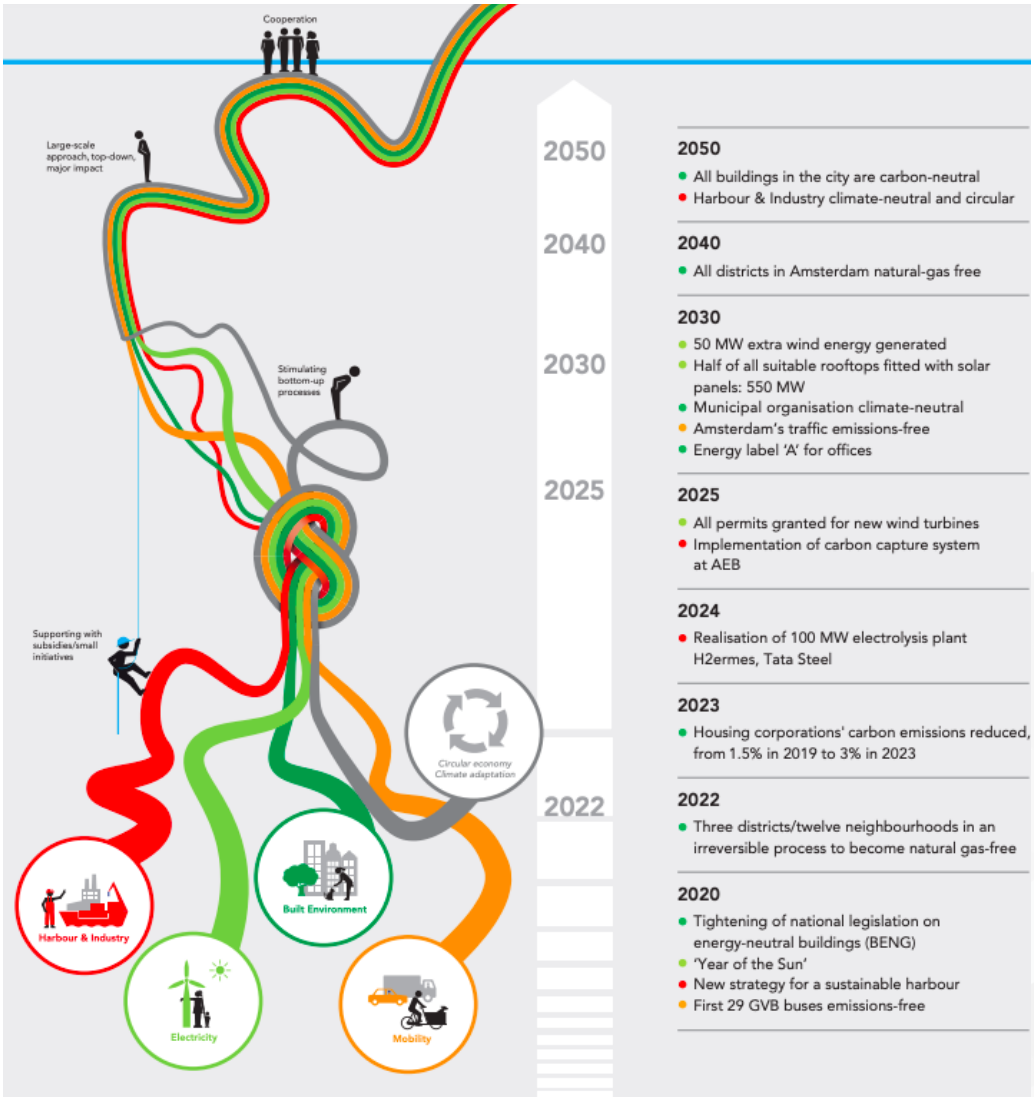

Figure 21. Main themes and objectives of the Climate Neutral Roadmap of Amsterdam. Source: City of Amsterdam

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As basis for the Amsterdam approach, international roadmap-like documents of other (Dutch and foreign) cities have been studied too. Oslo had an advanced climate budget approach, which has been discussed with them. Copenhagen is studied for their waste processing emissions. Manchester, Paris, Stockholm and New York have also been viewed. Paris had an interesting participation project, but due to lack of capacity, it was not considered.

Figure 22 collects the actions taken in Amsterdam Roadmap development process for research themes. The presented actions are placed within the other elements (see figure overview in Figure 17), the elaboration of themes are closely related to city and stakeholder engagement (section 6.1.1) and the climate budget (Section 6.1.4).

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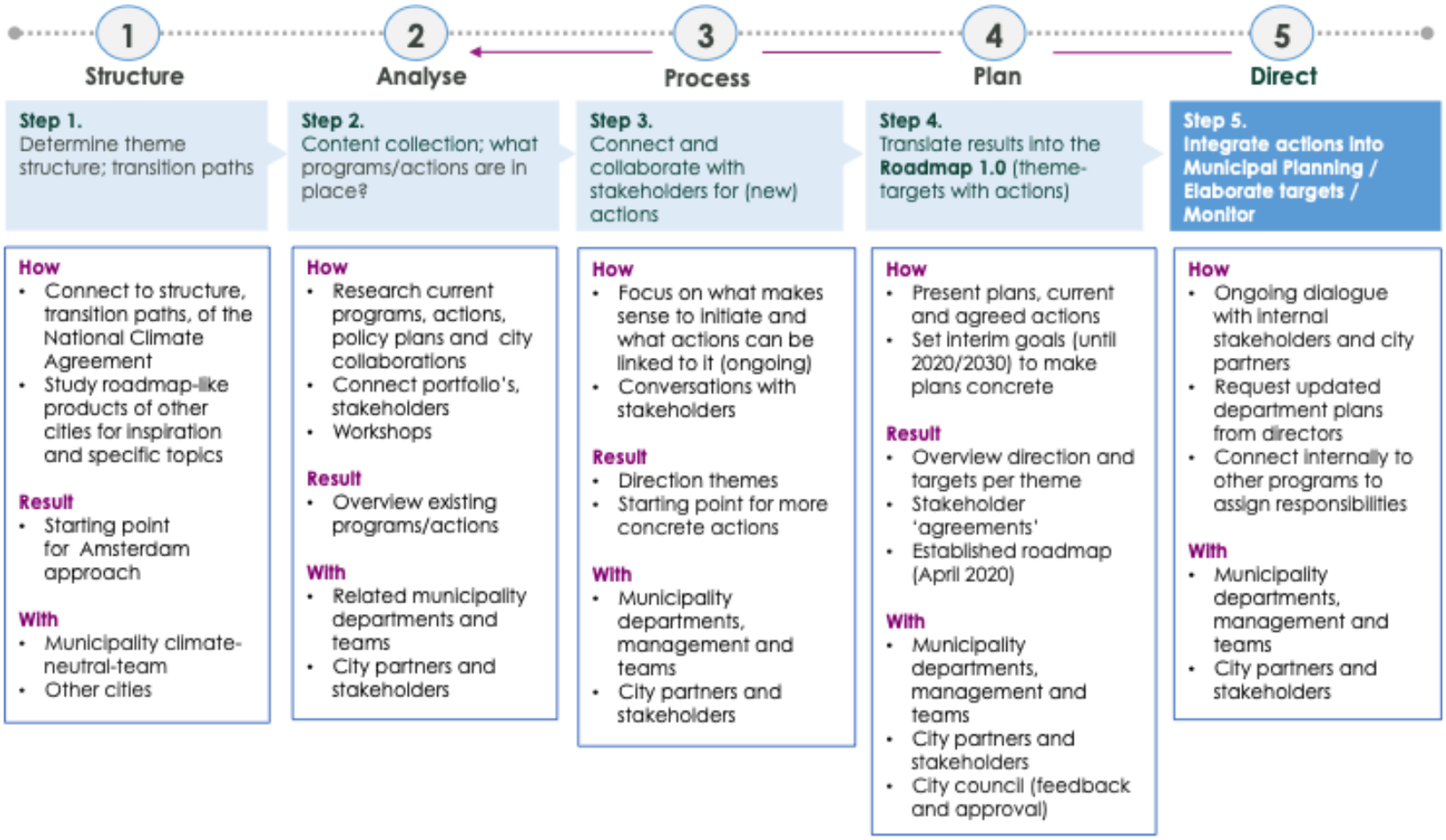

Figure 22. Research themes - actions taken. Source: City of Amsterdam

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6.2.3. Planning Roadmap – Internal stakeholder engagement

The climate-neutral-team (part of the sustainability department) started with a core team of 6 and grows from 2019 to more than 50 employees.

The draft of the 'Climate Neutral Roadmap: Invitation to the city' (see section 6.1.1) was widely shared with partners in the city and supplemented by the many responses received. All this knowledge and experiences form the basis of the Climate Neutral Roadmap. However, there was no project plan and the approach was set up without any form. An overview planning of the internal dependencies between related products, actions and decision-making was made, and constantly updated.

Actions taken related to stakeholder engagement are described in Figure 23. Tips and lessons in this field are described in Figure 24. Following the figures, a number of reflections and comments from involved stakeholders are given.

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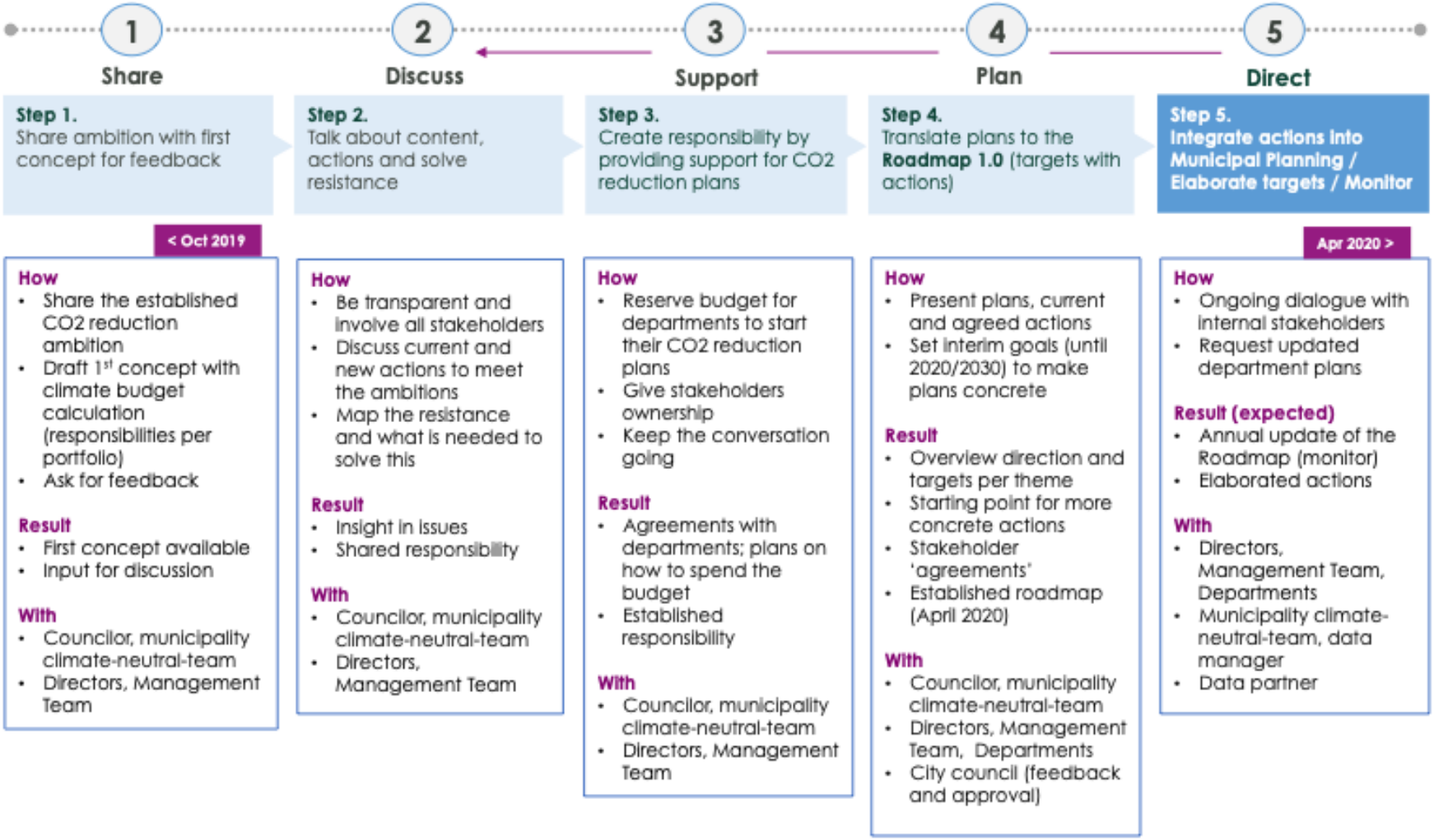

Figure 23. Stakeholders engagement - actions taken. Source: City of Amsterdam

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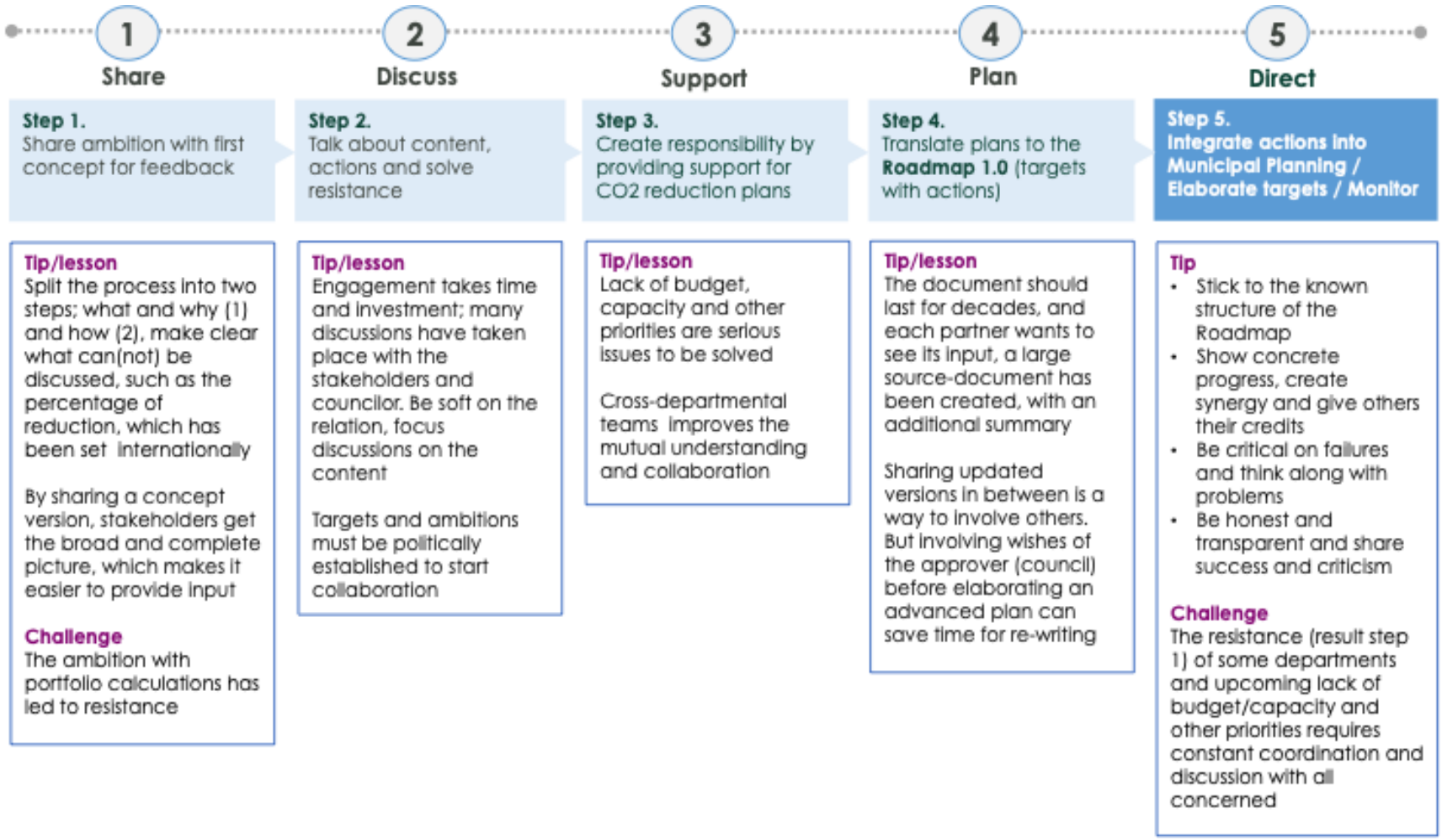

Figure 24. Stakeholders engagement - tips & lessons . Source: City of Amsterdam

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The described steps to involve management and the internal organization are recurring actions. The views on this process are broad. As a result, a number of reflections of the involved stakeholders were obtained. These valuable reflections and advices for any city in the process of City Vision creation, have been divided in two according to the provenance of them: 1) Roadmap core-team members and 2) internal stakeholders.

1. **Roadmap core-team members**

Splitting up the process into 1) what are we doing and why and 2) how are we going to do it worked quite well. There was no clear plan how things would go and it had to be done quickly, we worked step by step to be able to make adjustments.

The available budget became apparent late in the process, which was complicated for the planning, but therefore its important to remain flexible.

In addition to splitting the process, make clear what can and cannot be discussed, such as the ambition for CO2 reduction by a certain percentage, which has been established internationally. Set interim goals (until 2020/2030) to make the plans concrete, take enough time to think about how and give everyone involved the space to think about it. Stay in touch with each other and let others take responsibility and ownership - it helps if a budget is made available.

-

Sufficient administrative priority is needed to get a roadmap-product off the ground, without higher support it will not work. The energy transition is an integral subject for which sufficient time must be made available.

Looking back, the climate-neutral-team could have submitted a draft of the roadmap earlier, because this generated the necessary responses. The first question to management boards to think along did not give much response, but apparently a document did.

-

Start with mapping the emission figures first, and then the commitment.

In Amsterdam, it turned out that electricity consumption in the business market had a large share, but no one was responsible for it, as a result of this a program for the business market was set up.

Subsequently, the climate budget revolves around getting the entire internal organization involved. Start sharing current emissions figures with colleagues to create shared responsibility (what goes with that).

Involve external parties; Amsterdam has set up an urban climate agreement, a platform. Rotterdam has equally sought out the breadth by organizing climate tables for each theme in order to make plans with several parties, in which the municipality is an equal partner.

A next time, Amsterdam would have the research department calculate the figures in order to be more independent. This knowledge transfer was not feasible for the roadmap. Amsterdam wants to involve more parties (such as CE Delft) in this.

The concept of Climate Budget was not clear for a long time, with the discussion about linking outcomes to portfolio holders. A decision was only taken late.

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Also, the question to CE Delft to calculate the plans was a learning point, after sending the measures they turned out not to be concrete enough. Ultimately, it was decided to elaborate the largest measures per transition group, this insight came quite late.

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With regards to the city participation, we concluded too late that we did not have the whole picture in mind, there was too much focus on the individual themes, an extra step had to be made which was not foreseen, this took more time than necessary. We have tried too much to please everyone at every stage, and to solve too many problems. A next time, we would organize it more tightly.

Advice for other cities; take enough time, make choices and set boundaries. There is a lot that you cannot do and you cannot reach everyone.

2. Internal stakeholder feedback

The management members involved have different experiences of the process and the content. They share relevant and critical feedback with advice for the team and follow-up.

-

The climate-neutral-team sees herself as a director, which is very good but not enough; capacity is still needed from their program. Now, the team should not only monitor but also remain a partner, with a specialized program and people who have knowledge, shape the network and contribute ideas. The effort may not disappear when the budget is finished. Directors can be the owner, but limited support is still required.

-

The Roadmap mainly deals with energy production and application in houses and buildings, but the route from energy to consumer, the underground infrastructure, must be included for practical feasibility. Depending on this, different parts of the city may require a different solution.

The long-term ambition should not be completely fixed on the technology, but built up. Now, realization, policy and vision run parallel because direct results must be achieved, but the outcome is uncertain. We have to create space to do things differently, otherwise it will crash at some point.

-

The energy transition is a gigantic task that requires much more than we can currently imagine. The alignment of ambitions and goals is essential. Now, the implementation is underestimated. The realization of the feasibility and the method of evaluation are underexposed in the Roadmap. The available instruments, such as legislation and budget, are insufficiently indicated - in the regulations matters are solved that do not connect with each other.

-

For the first time, the Roadmap has mapped out what is needed to achieve the ambitions. Previously, there were only measures, but now we have analyzed what is needed to be climate

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neutral by 2050. It has been made clear that this has an impact on all policy areas. Particularly in the preparation of the climate budget, the impact of the plans and the emissions per portfolio has been made even more concrete. These figures and responsibility were met with resistance, but the main goal is to provide insight into the scope. The Roadmap shows that a lot has to be done and that plans have to be made. In theory, the ambition is feasible; the Roadmap has given direction but has not yet been elaborated.

6.2.4. Climate Budget (calculation)

The Climate Budget maps out who is responsible for the CO2 emissions and which effect the proposed measures have on reducing the emissions. To keep up with and evaluate the progress, the city is drawing up an annual 'climate budget'. This maps out who is responsible for the CO2 emissions and which effect the proposed measures have on reducing the emissions.

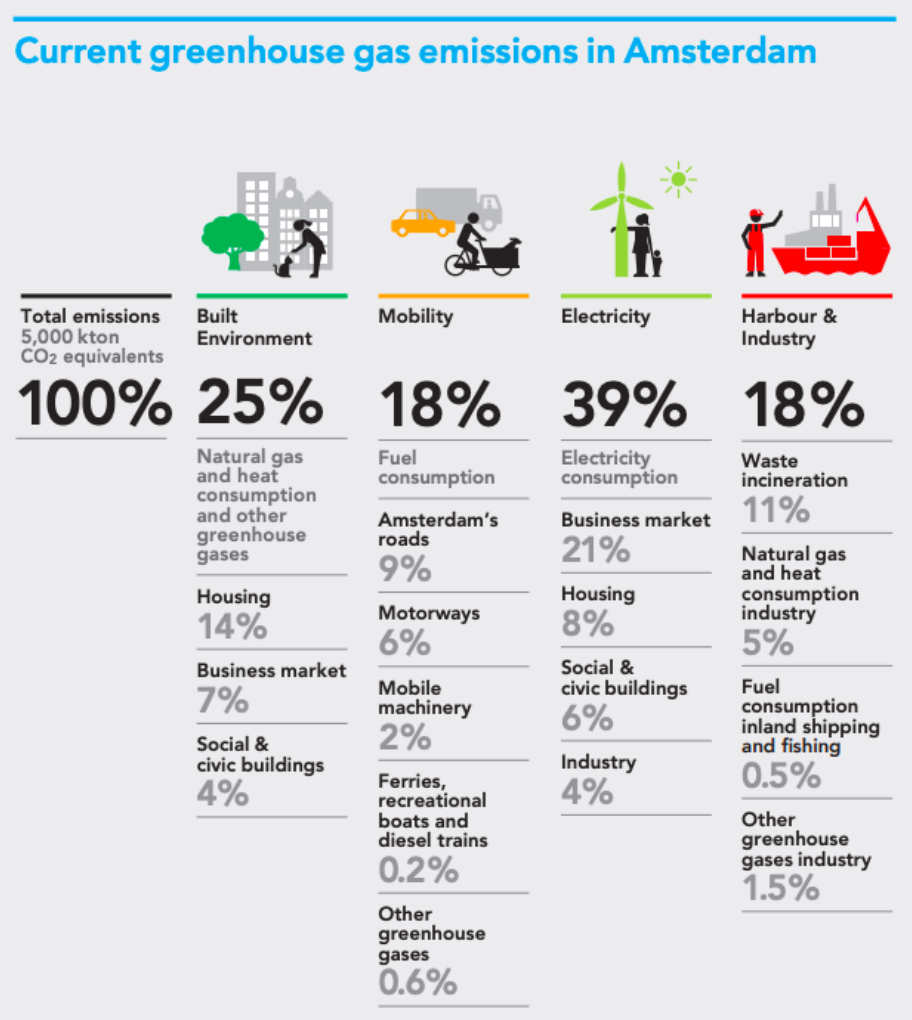

Figure 25. Main features of the current Climate Budget of Amsterdam. Source: City of Amsterdam

The Climate Budget point out that between 1990 and 2010, CO2 emissions increased, and that was mainly due to the city's strong growth. Since 2010, the emissions have decreased as a result of proactive climate and energy policies. But the reduction must happen a lot faster to

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fulfil the ambitions. From 2020 onwards, the city is monitoring the numbers on a yearly basis and will adapt and add to its measures based on these observations.

Figure 26. Climate Budget and 2030 objectives of Amsterdam (English version not available). Source: City of Amsterdam

Climate Budget development Actions are described in Figure 27. Tips and lessons in this field are collected in Figure 28.

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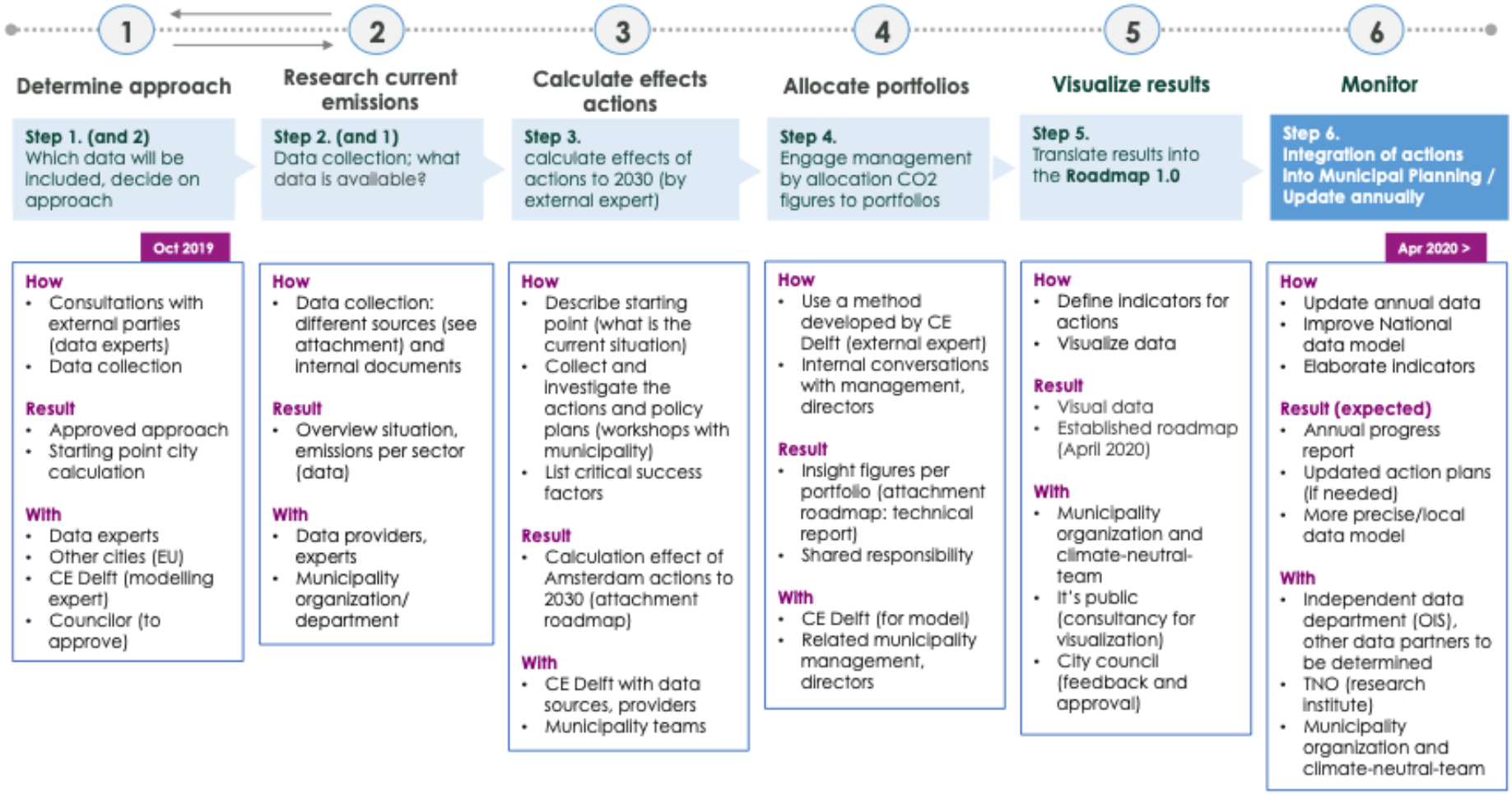

Figure 27. Climate Budget (calculation) - actions taken. Source: City of Amsterdam

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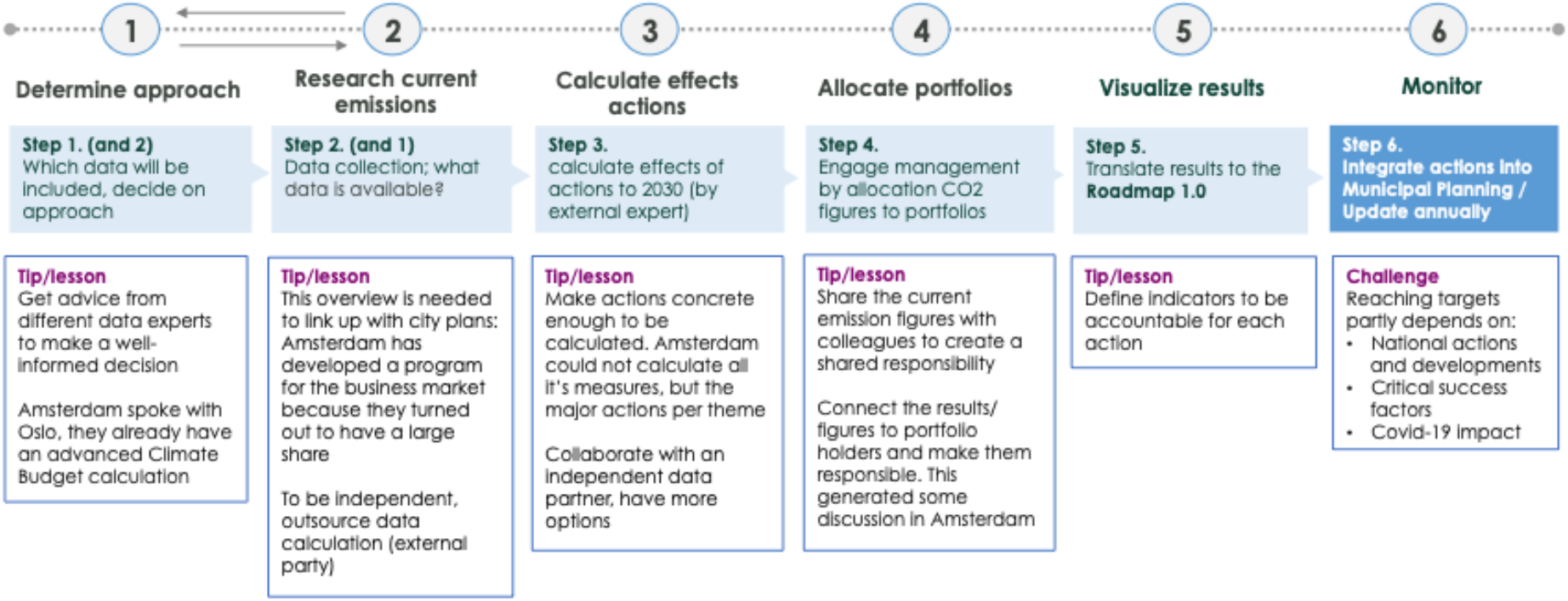

Figure 28. Climate Budget (calculation) – tips & lessons. Source: City of Amsterdam

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6.3. Amsterdam Climate Neutral Roadmap versus City Vision co-development Roadmap

The Amsterdam Climate Neutral Roadmap creation experience provides a valuable information to ATELIER cities in their City Vision creation process. The reflections, procedures, tips and lessons from Amsterdam will help to avoid problems and overcome potential barriers in ATELIER cities.

In order to understand the momentum in which all this valuable information could have over ATELIER cities City Vision creation process, this section connects the methodology followed by Amsterdam and the steps of the Cities4ZERO methodology (Figure 29).

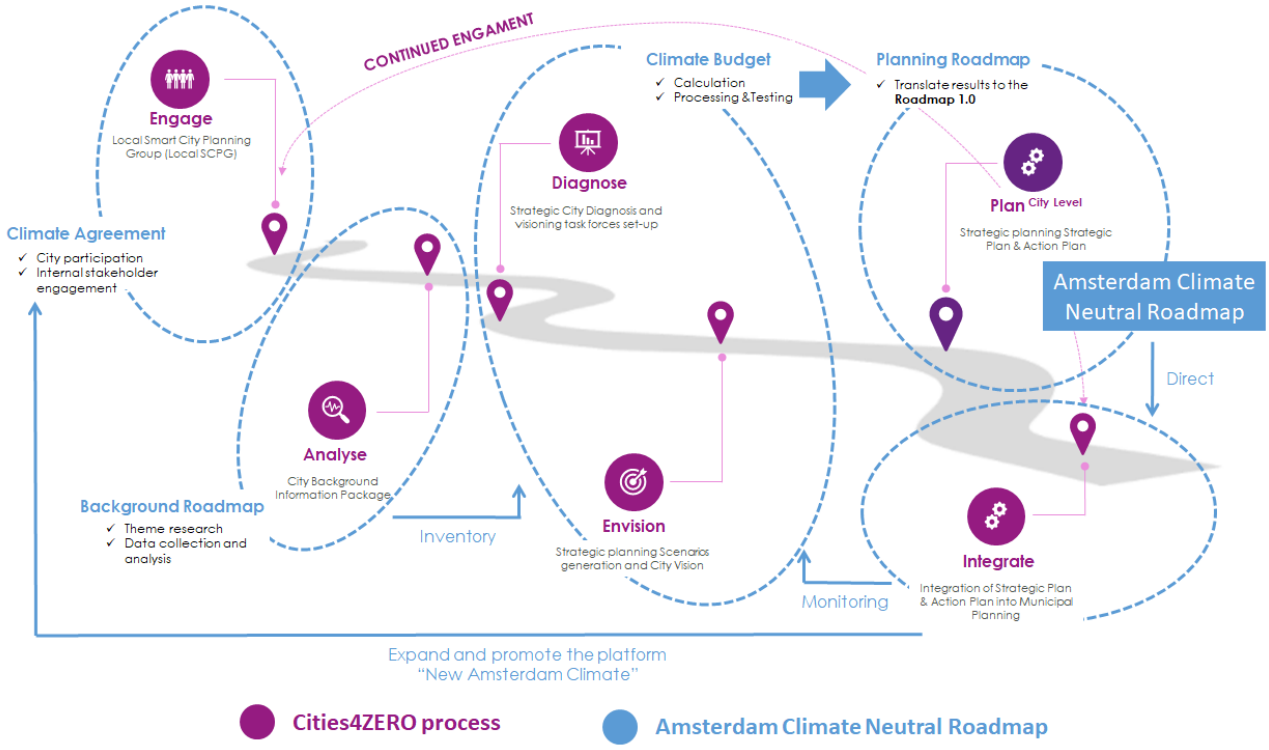

Figure 29. Amsterdam Climate Neutral Roadmap versus City Vision co-development Roadmap. Source: City of Amsterdam

Before going in depth, analysing step by step the connections, several considerations have to be pointed out:

- Cities4ZERO methodology is divided in 6 steps that highlight the main elements to be considered in the City Vision creation process. However, this does not necessarily mean that the steps are closed blocks that start after the previous.
- Same comment applies to Amsterdam Climate Neutral Roadmap creation, where the 4 main tasks are intertwined.
- Therefore, the steps/tasks of both methodologies can be parallel and sometimes iterative.

Dividing the process in these steps/tasks is helpful to explain and organize the process and, in this section, to understand the commonalities and differences between both processes. In

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any case the models must be considered as purely linear, step by step and divided in closed blocks.

Step 1. Engage and Climate Agreement.

Both methodologies see stakeholder involvement as a key issue in the success of the City Vision creation process. In the case of Amsterdam, the internal stakeholder involvement started with a core team of 6 and grows from 2019 to more than 50 employees. Amsterdam sees the Smart City Planning Group (SCPG) of the Cities4ZERO as a good opportunity to give structure to the ongoing stakeholders involvement and presented a draft of their SCPG in January 2020.

Step 2. Analyse and Background Roadmap.

Both methodologies consider that a deep knowledge of the casuistic of the city is needed in order to understand properly how to deal with the process. In the case of Amsterdam, this went beyond the step 2 of Cities4ZERO and overlaps some parts of the Step 3 diagnosis and even Step 4 Envision. Anyway, the scope of both methodologies in this sense is similar, and the steps are not necessarily directly correlated.

Step 3. Diagnosis, Step 4. Envision and Climate Budget

Main differences between both methodologies are found in these steps.

Climate Budget of Amsterdam was set and follows the fulfilment of a scenario created for Carbon Neutrality achievement. The calculation consists of a number of elements. First of all, a point of departure was established: emissions in 1990 and current emissions. The figures for 2017 were taken as the starting point for current emissions, as all figures were available for that year. The municipality subsequently gathered a series of policy documents, including both established and intended policy. These policies were evaluated per measure in terms of the objective, target group, set of instruments (legal, economic, facilitating, or action to be taken by the municipality), whether the effect of the policy on the ultimate CO2 emissions target is specified, and using which intermediate targets (for example, by reducing gas consumption). Policy that lacked sufficient specificity in relation to the target group, instruments or intermediate targets was not included in the calculation. In addition, critical success factors were considered. The legal framework has yet to be developed, and the municipality is dependent on new regulation from central government. Moreover, for the most part, actual reduction will ultimately be a matter for companies and residents. The success of Amsterdam's policy is thereby dependent on the many factors that make the intended transition more or less attractive for them. In view of this, a range was drawn for calculating the effects. Autonomous developments, particularly policy resulting from the Climate Agreement, will also have an impact on Amsterdam's carbon emissions. For this, use was made of the Climate and Energy Outlook 2019 (Klimaat- en Energieverkenning, hereinafter: the KEV) by PBL (2019a), and PBL's calculation on the Climate Agreement (2019b). This, too, uses a range. Finally, the effect of the growth of the city was isolated. The growth of the city will result in extra carbon emissions, although relatively few. New-builds will be natural gas-free, for example. Although this can also be viewed as an effect of intended policy and autonomous developments, the effect is less carbon reduction than avoided growth in carbon emissions.

On the other hand, and as it is explained in section 4, Cities4ZERO analyses several pathways or scenarios to reach carbon neutrality trying to identify the one that suits better the city characteristics and needs. Therefore, the step 3 diagnosis is focused in making a strategic

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diagnosis of the city and on setting up the visioning task forces that will guide the scenarios development and the step 4. Envision.

Although several differences are found in the process, the result of both methods is the same. Both provide the information needed to create the Roadmap of the city for Carbon Neutrality. For example, from the table presented in section 4 (Table 3. Quantitative and qualitative methods that can be used connected to foresight process (in bold those suggested in ATELIER). Source: Fernández Güell (2011)) regarding existing methods and instruments to help in the process of City Vision creation, Amsterdam used the ones highlighted in bold in 10.

Quantitative Methods	Qualitative Methods
Analysis of city trends	Surveys
Temporal series	**Interviews with experts**
Simulation models	Delphi analysis
Systems dynamics	**Analysis of city trends**
Crossed-impacts analysis	Scenarios generation
Cost-benefit analysis	PESTEL analysis
Risk analysis	Visioning
Input-output analysis	Incasting/ backcasting
Gamification	Decision trees

Table 10. some methods and instruments used by Amsterdam[33] in City ambitions definition

Step 5. Plan and Planning Roadmap

City ambitions (in Amsterdam terms) and City Vision (in Cities4ZERO terms) definition converge in a common result, the plan. In the case of Amsterdam, they called it Amsterdam Climate Neutral Roadmap (Routekaart Amsterdam Klimaatneutraal). In the case of the plans developed behind the Cities4ZERO methodology, general guidelines were given in section 5 and they will take the form that answers better the specific needs of ATELIER cities. This is one of the main potentialities of Cities4ZERO methodology, that establish a general framework adaptable to different city casuistic.

[33] Methods used by internal City of Amsterdam staff and/or as part of the studies conducted by external consultancies.

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Step 6. Integrate

The integration of the plan into Municipal planning usually is challenging. Because of that Cities4ZERO involves stakeholders from different areas through the SCPG creation in the early stages of the process.

In the case of Amsterdam, with the Roadmap approved recently, several actions are ongoing to deal with this part. Whether progress is being made will be clear from the annual reporting on the Roadmap; starting from 2021 onwards. The City will report on the quantitative part by producing an annual update on the Climate Budget. This will reflect on the past and look on the future. The progress made on various indicators and measures, including carbon emissions, will be described. The estimate for Amsterdam's carbon emissions in 2030 will be updated annually in a standardised way. If figures show deviation from the ambitions, the approach will be adapted by optimising the present measures and including additional measures in the annual report. The first Annual Report is envisioned to be sent to the City Council in May 2021. The first year was a bit extraordinary because of the ongoing COVID-crisis with substantial impact on all activities. In 2020, it led to the adoption of a Plan for Sustainable Recovery; another co-creation plan of the city departments. Other actions regarding integration step in Amsterdam include expand and promote the platform "New Amsterdam Climate".

As it was mentioned before, (part of) the legal framework has yet to be developed, and the municipality is dependent on new regulation from central government. Therefore, Amsterdam sees potential to improve and consolidate this step.

This section has explained how Amsterdam's experience can enrich City Vision creation of ATELIER cities knowing that each city has its own dynamics. Amsterdam is interested in knowledge sharing in both directions and, among others, is part of the (global) Climate Neutral City Alliance (CNCA) network and was partner in the EU-funded research projects City-Zen and Transform.

Cities4ZERO methodology can help Amsterdam too, in identifying steps that can be further developed, can provide methodology and tools to round out the process making the plan even more integrated, completed and robust. The identification of these elements will be the next step of ATELIER and the conclusions will be presented on the Roadmap of the work to be done with each city in terms of City Vision (expected in June 2021).

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7. Deviations to the Plan

There are no deviations.

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8. Outputs for Other WPs

Besides being a necessary input for WP2 and City Vision development, it also provides inputs for other WPs:

- WP3 (PED Innovation Ateliers)
- Both demonstrator WPs (WP4 & WP5)
- WP7 (Citizen & stakeholder engagement)

The process for the PED Innovation Ateliers development (WP3) is quite linked with the Cities4ZERO methodological framework that will support the project development and beyond.

Furthermore, during the Municipality coordination of Demo Sites in WP4 and WP5 a common methodological approach can have a crucial role for the PED deployment in Amsterdam and Bilbao

For WP6 - the PED Replication and Upscaling – as for WP2, it will be also critical the provision of a tested methodological framework for a better identification of potential areas to develop PEDs and facilitating the design of the replication and upscaling strategy.

In relation to WP9 - Monitoring & Impact Assessment- monitoring will focus on the actual performance of the PED measures, while impact assessment will compare the actual performance with the performance in business-as-usual scenarios (BAU) developed in the City Scenarios actions.

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