ROADMAP

TO 100% RENEWABLE ENERGY

City of Avellaneda, Argentina

Credits: Guillermo Gregoret, 2024.

ICLEI Local Governments for Sustainability

100% RENEWABLES CITIES & REGIONS ROADMAP

Supported by:

Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

IKI INTERNATIONAL CLIMATE INITIATIVE

This 100% Renewables Roadmap for the City of Avellaneda is the culmination of the work under the 100% Renewables Cities and Regions Roadmap project. It represents the final outcome of an extensive consultation process, beginning with securing political commitment and engaging relevant stakeholders, and progressing through data collection and energy systems modeling to provide a feasible pathway towards 100% renewable energy use. This roadmap document lays out the local strategies, implementation mechanisms, and recommendations for the local government to realize this vision.

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Cristian Quiroz — Secretary of Treasury and Finance
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About the 100% Renewables Cities and Regions Roadmap project

The 100% Renewables Cities and Regions Roadmap project facilitates the energy transition by raising local awareness on renewable energy sources, showcasing how local and national governments can create coordinated enabling frameworks and policies, exploring access to public and private sector finance, and building local renewable energy projects to address electricity, heating and cooling.

The 100% Renewables Cities and Regions Roadmap project is implemented by ICLEI — Local Governments for Sustainability and funded by the International Climate Initiative (IKI), which is implemented by the Federal Ministry for Economic Affairs and Climate Action (BMWK) in close cooperation with the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the Federal Foreign Office (AA).

About ICLEI — Local Governments for Sustainability

ICLEI — Local Governments for Sustainability is a global network working with more than 2,500 local and regional governments committed to sustainable urban development. Active in 125+ countries, ICLEI influences sustainability policy and drives local action for low emission, nature-based, equitable, resilient and circular development. ICLEI's Members and team of experts work together through peer exchange, partnerships, and capacity building to create systemic change for urban sustainability.

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100% RENOVABLES HOJA DE RUTA DE CIUDADES & REGIONES

Fomentado por:

Ministerio Federal de Economía y Protección del Clima

IKI INTERNATIONAL CLIMATE INITIATIVE

en virtud de una decisión del Bundestag alemán

Crédits: Guillermo Gregoret, 2024.

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Abbreviations and Acronyms

(Derived from spanish)

ACIA - Asociación Civil Impulsar Avellaneda (Driving Avellaneda Civil Association)

ADR - Association for Regional Development

AFD - French Development Agency

CADER - Argentine Chamber of Renewable Energies

CAMMESA - Company Manager of the Wholesale Electric Market S.A.

CFE - Federal Energy Council

CFI - Federal Investment Council

CHP - Cogeneration Heat Power

COSEPAV - Cooperative of Public Services

EE - Energy Efficiency

ENARGAS - National Gas Regulatory Body

ENERFE - Public Renewable Energy Company of Santa Fe

ENRE - National Electricity Regulatory Body

EPESF - Santa Fe's Provincial Public Electricity Distribution Company

FPAV - Progresar Avellaneda Foundation

INTA - Instituto Nacional de Tecnología Agropecuaria (National Institute of Agricultural Technology)

MATER - Term Market for Electricity from Renewable Energy Sources

RE - Renewable Energies

ER - Energías Renovables

SWOT - Strengths, Weaknesses, Opportunities, Threats

PIT - Project Implementation Team

SADI - Argentine Interconnection System

SAPEM - Public Limited Company with Majority State Participation

SIID - Integral Solutions for Engineering and Development

SyESA Gas - Services and Undertakings S.A.P.E.M.

TGN - Transportadora de Gas del Norte S.A.

UAA - Unión Agrícola de Avellaneda Coop. Ltda.

UCP - University of the Cuenca del Plata, Avellaneda

UNL - Universidad Nacional del Litoral

UTN - National Technological University

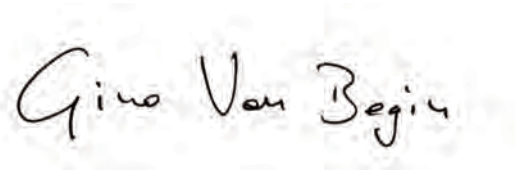
Our cities are home to over half of the world, population, are responsible for over two-thirds of global energy consumption, and produce over 70% of carbon dioxide emissions. The role of subnational governments as key actors and sites of transformation throughout the energy transition cannot be overstated. They are at the frontlines, dealing with both the challenges and opportunities of reducing emissions and making their communities more resilient against the impacts of climate change.

Renewable energy can contribute significantly to both these goals. The journey to 100% renewable energy is not an easy one, and we commend the bold ambition of the cities and regions that have undertaken it under the 100% Renewables Cities and Regions Roadmap project, notably Avellaneda in Argentina, Kisumu County in Kenya, and the Province of West Nusa Tenggara in Indonesia. Through their roadmaps, each has charted its own path towards creating a renewables-based energy system that serves the needs of their respective communities, while contributing to global efforts to tackle the climate emergency.

The goal of 100% renewable energy demands bold action to match the level of ambition. It is more than a technological shift—it is a systemic transformation of how we live and relate to our planet, requiring placing sustainable energy systems at the core of our planning efforts while remaining conscious of the socio-economic realities of our communities. Each of the roadmaps developed through the project symbolize what can be achieved when subnational governments become dynamic leaders in the shift towards renewable energy.

It is important to note that this journey cannot be undertaken alone—forging new and lasting partnerships with various stakeholders is critical for turning ambition into reality. Working closely with national governments through improved multilevel governance can help create national frameworks that enable subnational governments to succeed.

We celebrate these cities and regions for taking on a leading role in the sustainable energy transition. Through their efforts and experience, they inspire other cities and regions to set ambitious renewable energy targets and drive climate action at the local and regional level.



Gino Van Begin
Secretary General
ICLEI – Local Governments for Sustainability

Climate change is a challenge that demands urgent action by governments at all levels because, in addition to its impact on nature, it has severe consequences on the economy, health, and well-being of communities. The decarbonization of energy sources and the democratization of the energy matrix are actions of great importance in terms of mitigation, increasing the resilience of urban environments and strengthening energy security.

From ICLEI — Local Governments for Sustainability, we are committed to promote and strengthen the action of subnational governments in the global climate agenda. It is the cities, due to their proximity to the dynamics of the territory, that have the appropriate knowledge to establish clear goals and guide innovative action, promote key alliances, and deploy the tools to address the climate emergency with effective and dynamic solutions.

The city of Avellaneda was chosen as a model city for the 100% Renewables Cities and Regions Roadmap project. We recognize the leadership and commitment of the mayor, his government team and the Local Working Group. We extend our thanks to the German Federal Ministry of Economics and Climate Protection through its International Climate Initiative for providing the necessary means to implement this very important project for the region.

This process of collective construction of the Roadmap, which lasted over two years, involved the municipality and the main actors of the territory: the scientific and technological sector, academia, the public sector, social organizations, private entities, and local residents, among others. It had the technical support of the World Secretariat, the Regional Office of South America and the ICLEI country office.

At the same time, the Fraunhofer Institute for Solar Energy Systems, The Renewables Academy AG, IRENA, the Global Platform for 100% Renewable Energy, and consulting firms with great expertise in energy matters provided technical work, as well as exchanges of knowledge and experiences.

The Roadmap for the Energy Transition of the city of Avellaneda, province of Santa Fe, Argentina, marks a milestone on the road to a decarbonized, less concentrated, and more equitable system, making the city an innovative and replicable model.

The deployment of this Roadmap is important because it provides a clear and coherent vision of the objectives for 2050 and the steps needed to achieve them, setting out intermediate goals and indicators through which to monitor the process. It also identifies priorities for action and provides a solid basis for defining projects for financing.

We hope this document will inspire and motivate action, acting as a reference for cities that want to achieve sustainable and resilient development in their territories.

María Julia Reyna
Executive Director
ICLEI Argentina

Rodrigo Perpétuo
Executive Secretary
ICLEI América del Sur

Climate change is one of the main challenges of our time, requiring coordinated actions at both global and national as well as subnational levels. The impact on all scales is undeniable, and the role of local governments is crucial in fulfilling the commitments established in the Nationally Determined Contributions (NDCs) and achieving the Sustainable Development Goals (SDGs).

In Avellaneda, we took on a leading role over a decade ago in designing public policies for local climate action, developing comprehensive, sustainable, and scalable environmental projects. The greenhouse gas (GHG) inventory, developed within the framework of the Local Climate Action Plan (PLAC, in the Spanish acronym), establishes that almost 40% of the city's CO2 equivalent emissions come from the energy sector. Therefore, having a low-carbon energy transition policy based on renewable sources is key at the local level and implies a high-impact paradigm shift for the socioeconomic, environmental, and productive development of the territory.

Since 2019, the 100% RE project, funded by the International Climate Initiative (IKI, in the German acronym) of the Federal Ministry for Economic Affairs and Climate Action (BMWK, in the German acronym) and implemented with ICLEI's technical support, has allowed us to be recognized as a "Model City for Argentina" and to develop the present Roadmap together with the main local stakeholders. This Roadmap, based on the energy modeling developed with the Fraunhofer Institute, establishes goals, objectives, actions, and indicators for 100% of our city's energy consumption to be supplied by renewable sources by 2050.

This Roadmap was constructed, agreed upon, and validated by the main stakeholders aiming to be key players in a just and resilient energy transition. It will serve as a guide for identifying and prioritizing the steps to follow, with projects and commitments marking a direction in the present and future planning of the city. In this regard, I would like to highlight COSEPAV's commitment and technical contribution in its role as electricity supplier.

In this sense, it constitutes a key tool for the analysis and planning of public policies, being a living document that will adapt to future changes and add new challenges as time demands, in order to guarantee a cross-cutting, multisectoral, and multilevel management.

I highlight the invaluable coordination role and technical support of ICLEI Argentina and the World Secretariat, as well as the international funding from the German government, to contribute to this ambitious Roadmap of Avellaneda in the local transition to achieve 100% renewable energy.

CPN Gonzalo Braidot
Mayor of Avellaneda

VISION 2050

By 2050, Avellaneda will be consolidated regionally as a model city in innovative and sustainable development, supplying 100% of its energy consumption from renewable sources, diversifying its productive system, and promoting responsible consumption habits that generate genuine employment in a circular economy framework, with a community that develops in an integrated and participatory manner.

Credits: Guillermo Gregoret, 2024.

EXECUTIVE SUMMARY

The "100% Renewables Cities and Regions Roadmap project — 100% RE" project aims to define ambitious strategies and implement transformative renewable energy policies at the sub-national government level. It supports the Nationally Determined Contributions (NDCs) and the Sustainable Development Goals of the 2030 Agenda on climate and energy. It promotes energy security and drives the transition to 100% renewable energy in cities and regions in Argentina, Kenya, and Indonesia.

It is funded by the Federal Ministry for Economic Affairs and Climate Action (BMWK) through the International Climate Initiative (IKI). ICLEI — Local Governments for Sustainability is the leading implementing partner. The project also includes input from other strategic partners such as the Fraunhofer Institute for Solar Energy Systems (ISE), the Renewables Academy (RENAC) AG, IRENA, and the Global 100% Renewable Energy Platform.

Avellaneda was chosen as Argentina's model city and main beneficiary for the development of a 100% Renewables Roadmap to 2050. The Roadmap was led by the local government with the support of local and national governmental, social, business, neighborhood, academic, and research actors. ICLEI Argentina provided technical assistance and support.

The creation of the Roadmap involved a solid work of survey, information analysis, solution design, strategic planning, and knowledge production. Among the main products were: a diagnosis that developed the National Energy Scenario Analysis and Stakeholders, the Initial Status Report, and the Modeling of the Energy System of the city of Avellaneda. The 2050 vision, principles, strategic axes, and objectives, goals and indicators, as well as relevant actions, were also built in various instances of collaboration and co-creation with citizens.

It is worth noting that the Energy Systems Modeling, carried out by the Fraunhofer Institute for Solar Energy Systems (ISE), provides highly relevant evidence regarding the enabling conditions of the city of Avellaneda to move towards a sustainable energy transition: the renewable energy generation potential is higher than the demand, mainly from biomass, solar photovoltaic, and wind power. In all the energy scenarios evaluated, the possibility of reaching 100% renewable energy by 2050 is demonstrated.

The chosen scenario presents solar PV as the main source of electricity with a share of 61%, followed by biomethane cogeneration with a share of 19%, and a fixed share of electricity supply provided by wind power of 20%.

The Roadmap Towards 100% Renewable Energy, which is presented in the following pages, is organized in three parts. The first part contains a brief contextualisation of the city and includes the results obtained throughout the participatory process for the formulation of the Roadmap. It also describes the starting point with the identification of the main critical issues that structure the agreements underpinning the Roadmap.

The second section presents the vision, principles, and values defined by the city of Avellaneda, as well as the timeline that will guide the execution of the actions and tasks designed in the Roadmap, together with the roles and responsibilities of the actors involved in the process, whose participation is strategic to leverage resources and collective efforts.

The third section presents the Roadmap's strategic axes, goals, targets, indicators, actions, and enabling conditions. The document closes with a description of potential sources of funding together with a set of policy recommendations.

PART 1: CONTEXT

Credits: Guillermo Gregoret, 2024.

1.1. INTRODUCTION

In 2022, Argentina started the fight against fires, droughts, and heat waves, the most evident effects of the climate crisis that is already upon the planet. Society demands climate change adaptation and mitigation policies, as well a greater multi-stakeholder commitment to protect ecosystems, reduce energy consumption, and move towards renewable sources.

Cities are the place where climate change is most starkly expressed, with impacts on the different dimensions of collective life and on the well-being of the population. They are the main producers of greenhouse gas emissions from energy use in the industrial, commercial, residential, transport, and waste sectors. Experts worldwide agree that global warming must be limited to 1.5°C above pre-industrial levels. To achieve this, the current level of emissions must be halved within this decade. The reduction of emissions, the transformation of the energy matrix, the development of transportation in combination with low-emission energy sources, the implementation of nature-based solutions and carbon absorption and storage mechanisms find fertile ground for expansion in cities. They have a leading role to play in generating valuable transformations that open the way to a sustainable future.

ICLEI — Local Governments for Sustainability runs the project **100% Renewables Cities and Regions Roadmap project — 100% RE**, with the aim of defining ambitious renewable energy policies and strategies from subnational governments. It supports the Nationally Determined Contributions (NDCs) and the Sustainable Development Goals (SDGs) of the 2030 Agenda on energy and climate change. It also promotes energy security and the transition to 100% renewable energy.

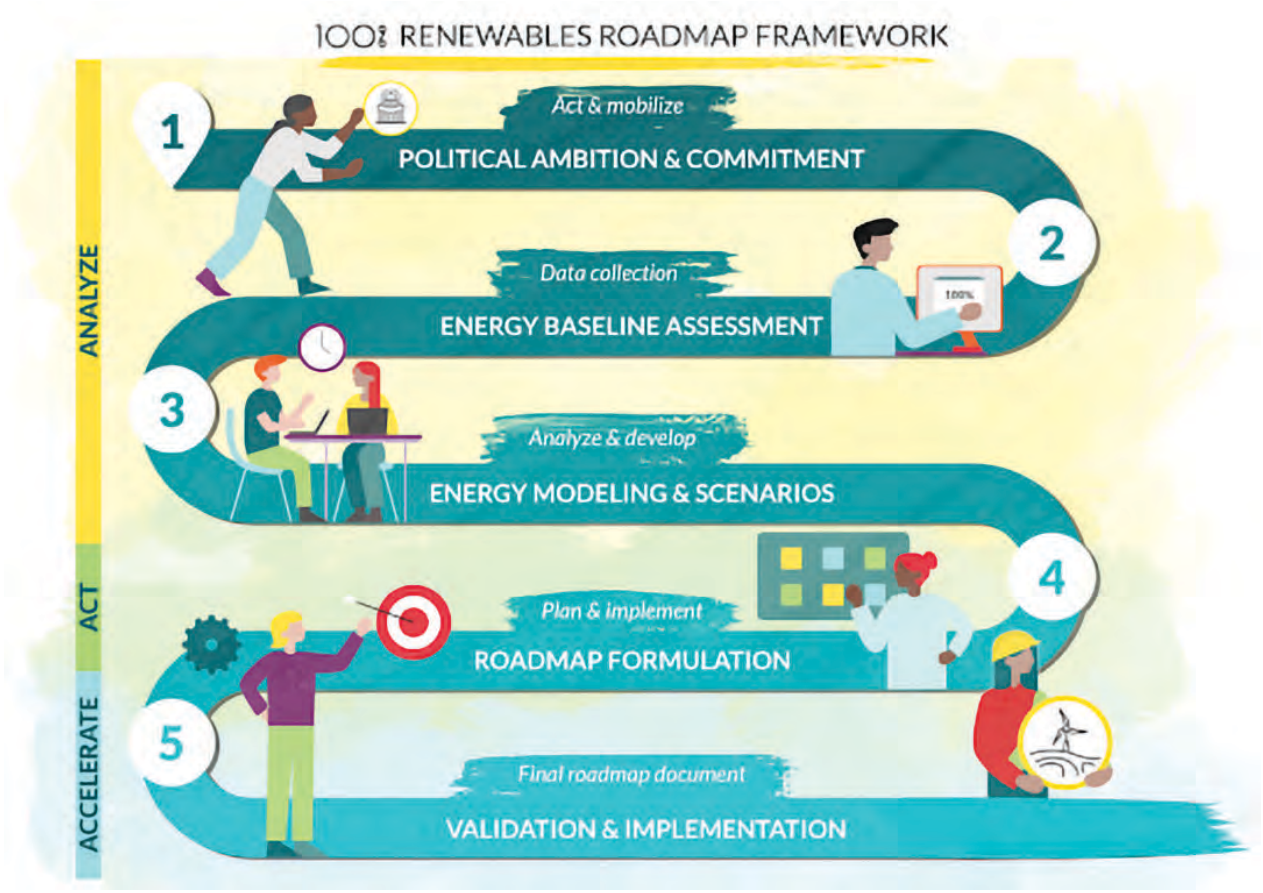
The city of Avellaneda, Province of Santa Fe, was selected in 2019 as a model city in Argentina for the 100% RE project. The choice considered its commitment to the environmental agenda, the potential for replicability, the socio-institutional conditions, and the existing management capacities. Improving ambient air quality, optimizing urban solid waste management, improving energy efficiency in different sectors, and promoting the transition to renewable energies are some of the main challenges that the city has defined to address in the coming years.

With a population of approximately 31,000 inhabitants and a total area of 937 km^2, the predominant economy is based on primary activity—particularly the agricultural sector, both agricultural and livestock, and the textile branch, which stems from the agricultural sector linked to cotton. According to the Avellaneda Energy System Modeling Report (2022), in terms of renewable sources, the greatest generation potential comes from biogas (72846 GWh/year) related to the presence of agricultural activities, followed by photovoltaic solar energy (13090 GWh/year) and wind power (5256 GWh/year), with the possibility of installing farms in rural areas of low or medium agricultural productivity. The great potential for biogas generation is highlighted by the six megawatt (MW) Avellaneda Biogas Thermal Power Plant, which generates electricity from biogas derived from the processing of bioethanol, corn flour, glycerine, and vinasse.

The city has made progress in improving energy consumption in the public sector with the implementation of LED lighting. It also promotes active mobility policies through the extension of kilometers of bicycle lanes and cycle paths, the public bicycle system, and the discouragement of private car use.

Once political commitment was secured, teams were identified to proceed with the planning of the Roadmap. The subsequent phases of the development process, as described in Figure 1, involve collecting data related to energy and socio-economic situations to inform the modeling of energy systems.

Figure 1: The 100% Renewables Cities and Regions Roadmap framework



Source: 100% Renewables Cities and Regions Roadmap Framework, 2021.

This Roadmap towards 100% Renewable Energy outlines the city of Avellaneda's pathways for the Energy Transition to 2050 by defining — collaboratively and co-created with the community — the vision, principles, strategic axes and objectives, targets and indicators, and relevant actions for their deployment. It also includes diagnostic tools such as the elaboration of different energy demand scenarios, the assessment of local renewable energy potential and the modeling of cross-sectoral energy scenarios based on 100% renewable energy sources. All this was carried out with the support of the Fraunhofer Institute for Solar Energy Systems (ISE).

The construction of the Roadmap has involved the participation of public and private actors at key moments of the process, through workshops, dialogue meetings, and working sessions for the construction of a solid framework of commitments and a broad base of social legitimacy in the community. The main actors involved were municipal and national government; cooperatives; businesses; industry; academia and research institutes; international cooperation agencies, local NGOs, professional associations, and social organizations; financial institutions; among others.

With these actions, it has been possible to plan the Energy Transition Towards 2050 by defining ambitious local renewable energy strategies, promoting energy security and contributing to national Greenhouse Gas emission reduction targets — especially the Nationally Determined Contributions and the Paris Agreement.

1.2 DIAGNOSIS

1.2.1. Local context in Avellaneda

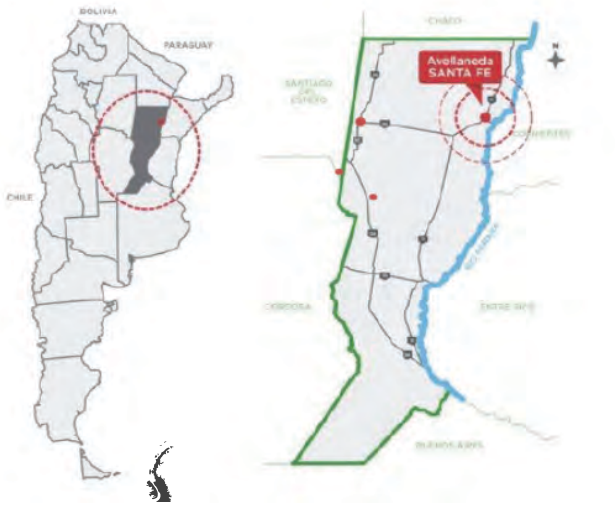
The city[1] has an estimated population of 30,897 inhabitants. It is located in the department of General Obligado in the northeast of the province of Santa Fe. It is bordered by the neighboring city of Reconquista, 5 kilometers to the south, and both localities make up the metropolitan area with approximately 117,300 inhabitants.

Table 1: Geographical and climatic information on Avellaneda

Latitude coordinate	32° 57′ 27″ S
Longitude coordinate	60° 38′ 22″ O
Reference distances in the province	It is located 320 kilometers north of the city of Santa Fe, capital of the province, on the RN 11 and 500 kilometers from Rosario.
Reference distances outside the province	It is 225 kilometers from Resistencia, capital of the neighboring province of Chaco, and 800 kilometers from the Federal Capital.
Average absolute minimum temperature	14.6 °C (58.2 °F) in winter
Average absolute maximum temperature	25.7 °C (78.2 °F) in summer
Average mean temperature	20.1 °C (68.1 °F)
Average annual rainfall	1260 mm. The wet season coincides with the spring-summer period.

Source: ICLEI Local Governments for Sustainability (2020). 100% Renewable — Roadmap for Cities and Regions: Energy Scenario and Stakeholder Analysis — Argentina. São Paulo, Brazil

Figure 2: Location of the city of Avellaneda, north of the province of Santa Fe, Argentina



Source: Image retrieved from ICLEI — Local Governments for Sustainability (2020). 100% Renewables Cities and Regions Roadmap: Energy Scenario and Stakeholder Analysis — Argentina. São Paulo, Brazil.

1 ICLEI — Local Governments for Sustainability (2020). 100% Renewables Cities and Regions Roadmap project: Energy Scenario and Stakeholder Analysis — Argentina. São Paulo, Brazil, retrieved on October 18th, 2023. Available at https://ameri-cadosul.iclei.org/wp- content/uploads/sites/78/2021/06/50-ly-reporte-avellaneda-esp.pdf

AVELLANEDA

Figure 3: District of the municipality of Avellaneda and urban area.

Source: Image retrieved from Google Maps.

The district of Avellaneda is located on the right bank of the Paraná River (the second longest river in South America). Its territory has an extension of 937 km^2, 65% of which corresponds to the Paraná River flood valley. The Jaaukanigás wetland, declared a RAMSAR[2] site in 2001, is located in this valley. The rest of the territory is made up of agricultural land, livestock, woodland, and urban areas. Avellaneda is located in a vast rural area. Agriculture (sunflower, soybean, corn, wheat, sorghum, cotton, and pastures) and livestock (cattle, pigs, poultry) are its main economic activities. It also has an important agro-industrial sector and an industrial and technological pole made up of companies of national importance that export globally. In the 100 municipal hectares of the Industrial and Services Park, there are over 70 SMEs, a Service Centre for Entrepreneurs with two incubation warehouses, one of them exclusively oriented to technology-based enterprises. The city is recognized at a national level for the presence of important companies, such as Grupo Vicentín SAIC and Unión Agrícola de Avellaneda Coop Ltda.

1.2.2 Actors and stakeholders

The "100%RE" action had a Project Implementation Team (PIT, Decree 066/2020), composed of representatives of the following Secretariats: Environment and Public Services; Projects and International Cooperation; Territorial Planning and Public Works; Treasury and Finance; Government and Citizen Participation; Human Development and Habitat; Production and Development; Institutional Communication. There were also representatives for the Municipal Council and the Avellaneda Public Services Cooperative.

2 A RAMSAR site is a wetland site designated to be of international importance under the RAMSAR Convention, an international environmental treaty signed on February 2nd, 1971 in Ramsar, Iran, under the auspices of UNESCO.

Table 2: Stakeholders and participants in the project.

Category	Interested parties	Roles and Responsibilities
Local authorities	• Municipal Executive	To promote and lead, together with ICLEI, the development of the Roadmap. To provide information, articulates activities with other actors, co-organises workshops and meetings. To provide guidelines, implement the Roadmap and monitor action.
	• City Council	To provide information on regulatory matters at the municipal level. To support and accompany the initiative. To participate in workshops and meetings.
Provincial authorities	• Secretary of Energy of the Government of the Province of Santa Fe • Secretary of Climate Change of the Government of the Province of Santa Fe	To provide information on regulatory matters and energy policies at the provincial level. To define policies that frame local action. It can provide or manage resources to finance the progress of the action. To participate in workshops.
Provincial authorities	• ENERFE SAPEM (Public-Private Renewable Energy Company of Santa Fe)	To provide information on public policy and regulation on energy transition and climate action at the provincial level. To support and participate in the elaboration of the Roadmap.
National authorities	• National Energy Secretariat	To provide information on public policy and regulation in the field of energy transition. It is part of the National Advisory Group.
	• Federal Energy Council (F.E.C.E.C)	To provide information on public policy and regulation on energy transition and climate action at the national level. To support and participate in the elaboration of the Roadmap.
National regulators	• ENARGAS (National Gas Regulatory Entity) • National Electricity Regulatory Entity	To provide information on national gas and electricity markets, regulations, availability, tariffs, and consumption. To provide the necessary regulatory guidelines to drive the energy transition.
National Administrative Body	• Wholesale Electricity Market Administration Company (CAMMESA)	To provide information on national electricity markets, regulations, availability, tariffs, and consumption. It is part of the National Advisory Group.

Category	Interested parties	Roles and Responsibilities
Private sector	• Cooperativa de Servicios Públicos COSEPAV (local electricity supplier)	To provide information on electricity consumption and trends. Key actor in the development and implementation of the Roadmap and scenario building.
	• Empresa Provincial de la Energía (Provincial Electricity Distribution Company)	To provide information on the state of the electricity sector at provincial level, tariffs, consumption data, and trends.
	• SyESA Gas SAPEM	To provide information on gas consumption and trends. To participate in the development of the Roadmap.
	• Bus and Minibus Drivers Work Cooperative	To provide information on the current situation of the public transportation sector. To participate in the elaboration of the Road Map.
	• Argentine Chamber of Renewable Energies — CADER (National)	To provide Renewable Energy technologies. They represent 96 private sector companies developing RE projects. They are part of the National Advisory Group).
Academia and local research institutes	• National Technological University — Reconquista Regional • National University of Litoral — Reconquista Avellaneda University Centre (CURA) • University of the River Plate Basin — Avellaneda • INTA — National Institute of Agricultural Technology	To participate in the development of the Roadmap. To share R&D projects and key academic developments and innovations related to the regional energy transition.
National Research Institute	• INTI — National Institute of Industrial Technology	To provide information on new renewable energy technologies under development and currently on the market. It is part of the National Advisory Group.
	• Centre for Research in Energy Economics and Planning (CIEPE) — San Martín National University (UNSAM)	To provide studies on energy planning and economic impact. It is part of the National Advisory Group.
Local companies	• Consortium Ente Parque Industrial Oficial de Avellaneda • Unión Agrícola de Avellaneda Coop. Ltda. • Vicentin SAIC • Solar City • Elmet S.A. • SIID Soluciones Integrales de Ingeniería y Desarrollo	To participate in the development of the Roadmap. To provide industry sector data and contribute to the identification of strengths, opportunities, weaknesses, and threats in the implementation of the Roadmap.

Category	Interested parties	Roles and Responsibilities
Renewable energy company	• Avellaneda Biogas Thermal Power Station	To provide information on biogas and electricity production, technology and the state of the renewable electricity market. To participate in the elaboration of the Road Map.
Civil society organizations at local level	• Regional Development Association (RDA) • Progresar Avellaneda Foundation • Civil Association Impulsar Avellaneda (ACIA) • Sustenta Litoral Civil Organization	To participate in workshops and the Roadmap process throughout its different stages.
Civil society organization at national level	• AMES Argentina (Women's Association for Sustainable Energy in Argentina)	To support the development of measures for a just energy transition. They are part of the National Advisory Group.
International organizations	• IRENA • Fraunhofer Institute • Global 100% • Renewable Energy Platform	To offer support with technical assistance. To participate in workshops and events. To develop energy system modeling. To develop the Building Blocks methodology for the Roadmap. Strategic vision input for coordinated governance in energy transition policies.
Financial institutions	• BMR Renewable Line • Banco de la Provincia • de Buenos Aires • Bank for Investment and Foreign Trade • (BICE) • Banco de la Nación Argentina • Association of Public and Private Banks of the Argentine Republic (ABAPPRA) • Association of Argentine Banks (ADEBA)	To support with recommendations and perspectives on project funding. To present their strategies, guidelines, steps, requirements for accessing credit, and sources of financing.
Implementers	• ICLEI Argentina • ICLEI South America • ICLEI World Secretariat	To implement the 100% RenewableCities and Regions Roadmap project. To coordinate the Roadmap development process, co-organize workshops, meetings, and trainings.

1.3. Avellaneda initial status

1.3.1. Energy system baseline

Energy profile of the city

The energy supply of the city of Avellaneda is provided by the following sources:

- Electric power from SADI through EPE and COSEPAV.
- Hydrocarbon fuels with biofuel cut.
- Biodiesel.
- Biomass for the industrial sector.
- Natural gas distributed by network.
- Bottled natural gas.

100% of the district is currently covered by the electricity grid. The Avellaneda Biogas Thermal Power Plant (CTBA) generates the equivalent of 50% of the total electricity consumed by the city and injects it into the SADI. This is a cogeneration plant that produces electrical and thermal energy from substrates derived from the processing of bioethanol, corn flour, glycerine, and vinasse.

For instance, from 2014 to 2019, the large industry sector represented the largest consumption, averaging 59%, the residential sector, 25%, and small industries, 2%. In this period, there was to be a 50% decrease in consumption in the commercial sector in 2019 due to the macroeconomic crisis. In the public lighting sector, the drop in consumption is due to the use of LED luminaires.

Table 3: Electricity consumption by consumption sector [GWh].

SECTOR | YEAR	2014	2015	2016	2017	2018	2019
Residential	23.77	24.74	26.62	25.43	27.1	24.6
Commercial	5.49	5.64	5.68	5.68	5.77	2.25
Small Industries	2.53	2.5	2.61	2.42	2.36	2.36
Large Industries	59.51	56.98	55.95	57.07	63.71	64.09
Lighting	3.45	3.22	3.32	3.33	2.53	1.94
Rural	3	5.68	3	3.08	3.04	2.75
Other	2.04	1.8	1.94	2.05	2.32	2.22

Source: Image retrieved from ICLEI — Local Governments for Sustainability (2020). 100% RenewableCities and Regions Roadmap: Energy Scenario and Stakeholder Analysis — Argentina. São Paulo, Brazil.

The "Other" sector includes COSEPAV's own use (electricity distribution, drinking water pumping, operation of drinking water treatment plants, and water distribution), public offices, schools, non-profit institutions, sewerage network lifting stations, sewage treatment plant, and traffic lights, among the main uses.

For more information on the city's energy sector, please refer to the Avellaneda Initial Status Report available in English and Spanish[3].

3 Visit: https://renewablesroadmap.iclei.org/resource/avellaneda-initial-status-report/.

1.3.2. Energy sector policies and plans

Annex 1 presents the main policies, plans, actions, projects and instruments associated with the energy system at different levels (national, provincial and municipal). For the construction of this information, the Initial Status Report (ICLEI, 2020) analyzing existing energy regulations and the "Public Policy Dialogue" held in August 2021 with the participation of the Project Implementation Team (PIT) and representatives of academic, economic and social institutions of the city were taken into account. At the national level, there are different laws and decrees that frame the following aspects:

- Promotion of renewable energies with national targets;
- Funds for the development of renewable energies;
- Promotion of distributed energy generation;
- Programmes on rational and efficient energy use;
- Promotion of electromobility;
- Promotion of solar thermal energy
- Promotion of the use of hydrogen as an energy carrier.

At the sub-national level, the Province of Santa Fe also reinforces interest in the transition to RE. It stands out as a pioneer province in programs associated with grid injection and distributed generation from renewable sources, as well as in the promotion of biofuels and electric mobility. It has also promoted energy efficiency in housing, creating certification mechanisms for EE labeling and a rebate on the Urban Real Estate Tax.

Finally, at the local level, Avellaneda has promoted actions related to energy efficiency, such as the replacement of LED lights. By adhering to the 100%RE project, the city will promote a new regulatory framework that regulates and supports the implementation of this Roadmap.

1.3.3. Strengths, weaknesses, opportunities, and threats.

Finally, at the local level, Avellaneda has promoted actions related to energy efficiency, such as the replacement of LED lights. By adhering to the 100%RE project, the city will promote a new regulatory framework that regulates and supports the implementation of this Roadmap.

Table 4: SWOT analysis

Strenghts	Opportunities
• Local governance, political commitment, and high-level leadership. • Availability of natural resources. • Inter-institutional work. • Local distribution cooperative with a strong • tradition in the city. • Local know-how in biomass technology, • photovoltaic solar energy, and energy • efficiency. • Presence of industries and entrepreneurial profile.	• Generation of new jobs linked to RE and EE at the local level. • Consolidation and development of the region's economy. • Technical support from ICLEI and joint work with other cities. • Expansion of local capacities linked to the energy transition. • Access to international funding.

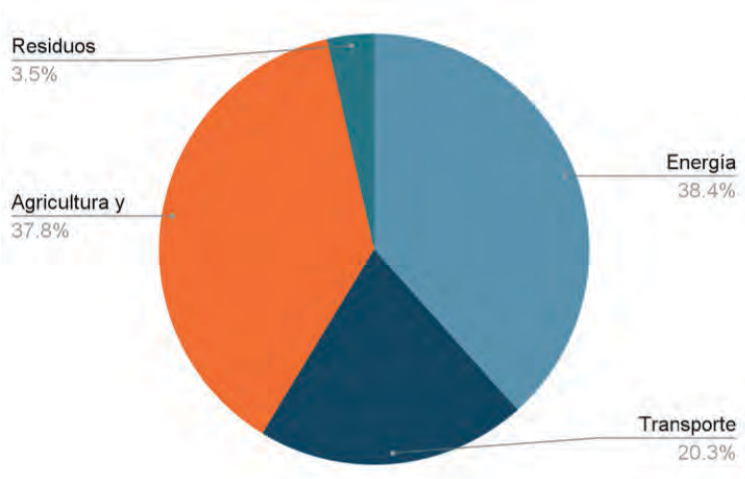
Weaknesses	Threats
• Lack of specific technical tools for RE development. • Limited financial resources and lack of funding at the local level. • Lack of a responsible culture in energy consumption habits. • Deepening of post-pandemic economic crisis, affecting strategic local industries. • Low involvement of strategic city stakeholders in energy transition.	• Post-pandemic macroeconomic and social consequences. • Existence of fossil energy subsidies and low cost of oil. • Economic crisis, scale of inflation and devaluation of the national currency. • Discontinuity of RE and EE promotion policies and projects at national and provincial level. • Insufficient national and provincial legal regulatory framework for RE and EE.

1.3.4. Emission baseline and baseline scenario

The city of Avellaneda developed its Greenhouse Gas Inventory in 2016, reporting a total of 115,157.94 tCO2 equivalent, considering emissions from basic scope sources. Analyzing the complete inventory in sectoral terms, 38.39% of emissions are attributed to the Energy sector, 37.76% to Agriculture and Livestock, 20.31% to Transportation, and 3.54% to Waste. Under a Business as Usual (BAU) projection scenario, an 84% increase in GHG emissions for the city is estimated by the year 2030, equivalent to 211,955 $tCO_{2\text{-eq}}$.

Considering the emission reduction target presented by the country and in line with the commitments of the Global Covenant of Mayors for Climate and Energy (GCoM), Avellaneda sets an even more ambitious goal: to reduce its greenhouse gas emissions by at least 29% compared to the BAU scenario by 2030. Thus, by 2030, the city will emit no more than 150,755.77 $tCO_{2\text{-eq}}$.

Chart 1: GHG inventory of the city of Avellaneda 2016



Source: Image retrieved from ICLEI — Local Governments for Sustainability (2020). 100% Renewable — Roadmap for Cities and Regions: Avellaneda Initial Status Report.

1.3.5. Renewable Energy Generation Potential in Avellaneda

The energy modeling report "100% Renewables: Energy System Modeling Results for Avellaneda, Argentina" yields the following results regarding RE generation potential:

Energy potential of biomass

The main agricultural crops are sunflower, soybean, maize, sorghum, wheat, cotton, and grasses such as oats and alfalfa. However, the residues of these crops remain in the fields, so the relevant biomass is not currently considered as potential for energy production. In the livestock sector, approximately 730,000 chickens and 30,000 cattle are reared, which represents a high energy potential from the use of manure.

Table 5: Theoretical livestock potential

	Livestock stock	**Specific methane production potential [m^3/year*animal]**	**Potential methane production in [m^3]**	**Potential methane production in [GWh]**
Chicken	600,000	1.64	948.000	8,856
Cattle	30,000	237	7,110,000	63,990

Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.

Wind and photovoltaic energy potential in rural areas

The city has a surface area of 119 km^2 in non-floodable areas for the installation of wind and solar photovoltaic power plants.

Table 6: Potential area and resulting installable capacity for photovoltaic and wind power plants

	Production capacity area [km^2] (GIS information)	**Resulting Potential [MW].**
Photovoltaic energy in rural areas	119	9,520
Wind power	119	1,819

Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.

Rooftop photovoltaic potential in urban area

Regarding the photovoltaic potential on roofs, it is indicated that 60% of the roof area has the potential for solar panels to be installed.

Table 7: Building area, roof area usable for PV installation and PV deployable capacity in each cardinal direction

Built area [km^2].	**Usable building area in each cardinal direction [km^2].**	**Deployable capacity in each cardinal direction [MW].**
1.75	1.05	26.26

Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.

1.4. Renewable Energy Scenarios in Avellaneda for 2050

The work of the Fraunhofer Institute for Solar Energy Systems Freiburg-Germany (ISE, in the English acronym)[4], also elaborated cross-sectoral energy scenarios based on 100% renewable energy sources towards the year 2050. For this purpose, it used the KomMod model for energy system assessment and optimization, which identifies the minimum cost mix of technologies according to specific targets and pre-defined boundary conditions. For these scenarios, energy demand projection analyses were carried out as shown in the following sections.

1.4.1. Trend demand, the basis for scenario building

In 2020 the city had 30,897 inhabitants.[5] The population is projected to increase to 45,025 inhabitants by 2050, with a total of 14,070 households.

The projection of annual global electricity demand to the year 2050 (calculated under three different indicators: total GDP, GDP per capita and specific GDP) yields results between 146 GWh and 182 GWh. The baseline scenario considers the intermediate projected demand of 152 GWh.

The residential sector's gas supply used to cover the demand for cooking, heating, and hot water is currently supplied by bottled gas or by connecting households to the gas network. Below is a summary of projected gas demand for cooking, heating, and hot water per household to the year 2050:

Table 8: Annual gas consumption of a household for cooking, heating, and hot water

Annual demand	Gas consumption [kg]
Gas demand for cooking	110
Gas demand for heating	100
Gas demand for hot water	90

Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.

As for transportation energy demand, it is assumed that the number of vehicles in the city will keep pace with the projected increase at the national level, reaching 50,363 vehicles in 2050 (Steingrube & Reggentin, 2022) and that the kilometers traveled by the different types of vehicles will remain the same until 2050.

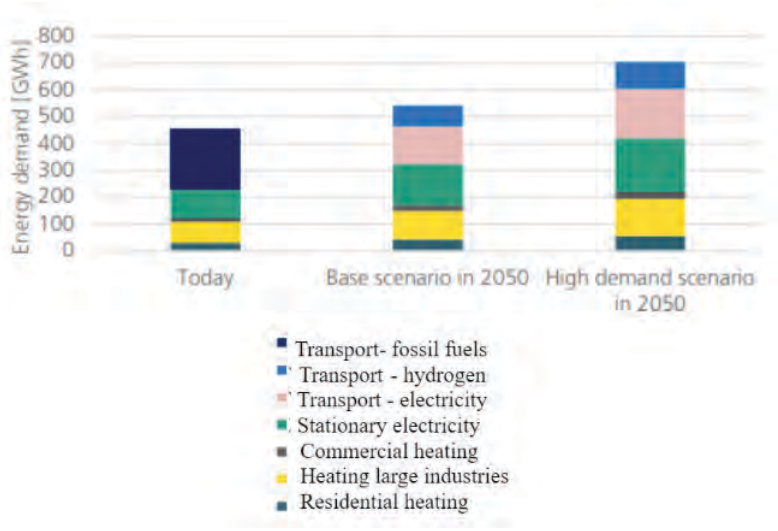
For cars, scooters, taxis, and vans, a 100% electrification rate is assumed and, for buses and trucks, the partial use of hydrogen is estimated. It is assumed that 50% of the trucks in Avellaneda will be hydrogen- powered vehicles by 2050.

Total energy demand will increase by 17% by 2050 in the baseline scenario and by almost 55% in the high demand scenario.

4 Visit: https://renewablesroadmap.iclei.org/wp-content/uploads/2022/03/Avellaneda_report.pdf

5 Based on projections from the Provincial Institute of Statistics and Censuses (IPEC) of Santa Fe for the year 2020.

Chart 2: Energy demand today and in the two 2050 demand scenarios



Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.

1.4.2. Renewable Energy Scenarios for Avellaneda by 2050

The modeling includes all relevant current and projected demand sectors to the year 2050, such as demand for electricity, cooking, and heating in households, the commercial and industrial sector. In addition, energy demand for land transportation is estimated.

Seven scenarios were evaluated, with six 100% RE scenarios varying according to three factors: biomethane fuel price, energy demand, and wind power share. In addition, a business-as-usual (BAU) trend scenario was modeled.

Table 9 below provides an overview of the scenarios considered.

Table 9: Summary of all calculated scenarios

Stage name	**Fuel price (low, medium, high)**	**Demand (base, high)**	**Wind power in electricity supply**
Base Scenario	half	base	20%
Minimum cost scenario	half	base	free
No wind power	half	base	0%
High demand	half	high	20%
High fuel prices	high	base	20%
Reduced fuel prices	low	base	20%
Business as usual	half	base	45.8%

Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.

As a result of the modeling, it is concluded that the city of Avellaneda has higher renewable energy generation potentials than its projected energy demand, and the clear possibility of reaching 100 % RE in all calculated scenarios is demonstrated, even with high demand scenarios. This allows great freedom of choice in terms of the technologies to be implemented in the energy system in the future, ensuring supply through technology diversification.

In the seven scenarios presented, the following technologies are considered for heat and heating demand in the domestic, commercial, and industrial sectors: heat pumps, electrolysis, boilers, and cogeneration heat and power (CHP) plants. CHP plants and electrolysers can only meet the demand for industrial heating, insofar as the sites are located in close proximity to each other.

The demand for hydrogen is the same in all scenarios, except in the BAU and high demand scenarios. In the latter, hydrogen demand is higher, while the BAU scenario has no hydrogen demand, since vehicles use electricity or mainly fossil fuels.

The energy demand for cooking is mainly covered by biomethane cookers in all scenarios, with a share varying from 56% to 100%. The highest share is reached in the low fuel price scenario, while the lowest share is reached in the high fuel price scenario.

The BAU scenario has the lowest share of photovoltaics, at 18%, while wind power is the main contributor, at 46%. Fossil fuels (oil and natural gas) account for 8%. In this scenario, electricity demand is lower than in the other scenarios, as less electricity is required for the transportation sector, which is mainly dependent on fossil fuels.

The base scenario, as well as the high fuel price, low fuel price, and high demand scenarios, have a wind power share restricted to 20%, with PV as the main electricity supply technology, with shares of 24% in the low fuel price scenario and 73% in the high fuel price scenario. In the no-wind scenario, PV has the highest share with 81%, since it replaces wind power plants.

In the least-cost scenario the energy system is constructed solely in relation to costs, where the technologies are only constrained by the given potentials, but not by additional constraints. In this scenario, wind power covers 40% of the electricity supply, while PV provides 42%.

1.5. Pathways to 100% Renewable Energy in Avellaneda

Among the 7 scenarios modeled as possible paths to 100% renewable energy, the one chosen is the so-called baseline scenario. This baseline scenario is considered the leading one for the city of Avellaneda.

This scenario considers an average demand, an average fuel price, and a fixed wind power share of 20% of the electricity supply. In this scenario, photovoltaics is the main source of electricity with a share of 61%, followed by biomethane cogeneration with a share of 19%.

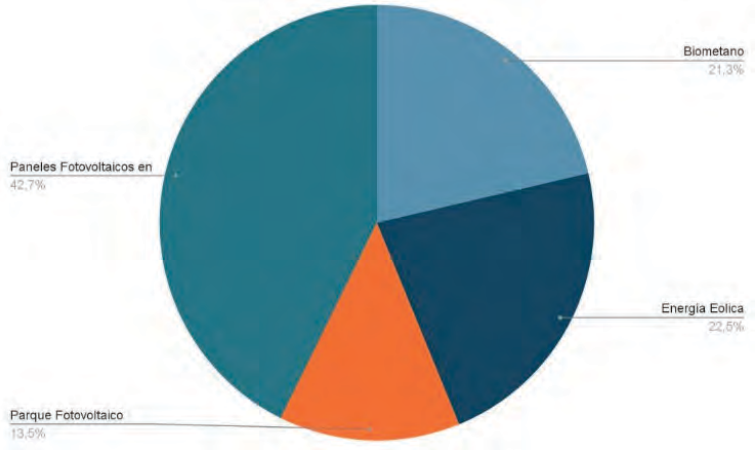
The decision on the technologies to be implemented, mainly solar photovoltaic parks, biogas cogeneration plants, and wind power, was based both on energy costs and potentials, as well as on local and national policy constraints.

Energy supply

Electricity demand in the leading scenario is supplied with 61% from photovoltaic energy, of which 53% comes from generation in rural areas. The second most important source is wind power, whose share is restricted to 20%, followed by biomethane cogeneration with 19%.

Electricity supply amounts to 421 GWh, which includes electricity demand from the residential, commercial, and industrial sectors, as well as demand from the transportation sector, both for vehicle electrification and hydrogen production.

Chart 3: Results of the leading electricity supply scenario in 2050



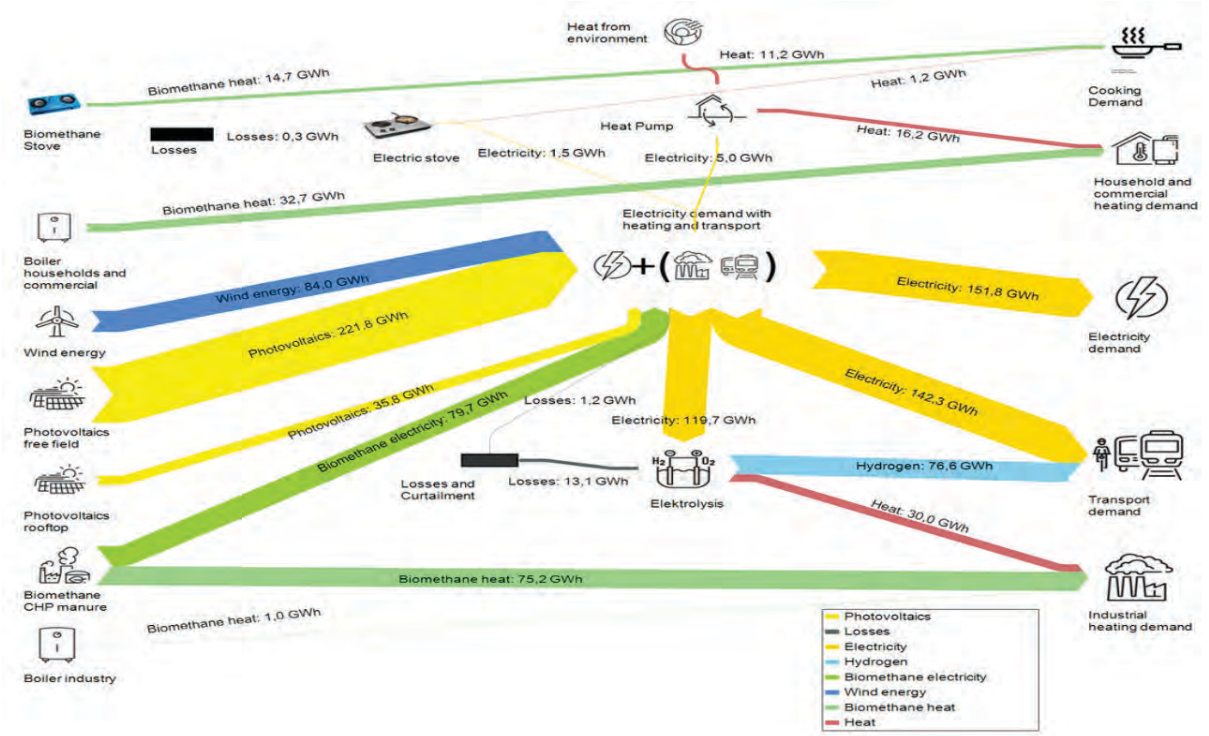
Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.

Some of the technologies implemented in the electricity production model are not considered in this scenario; these are CHP from municipal solid waste and fuel cells. Since the levelized energy costs for CHP from waste are higher than the levelized energy costs for CHP from biomethane, they would only be installed if the biogas potential of waste from the livestock sector is fully utilized. Fuel cells use hydrogen and convert the energy from the fuel back into electricity and heat. This process is associated with losses, but has the advantage of being able to store hydrogen more efficiently than storing electricity in batteries, especially in the long term. The use of batteries proves to be the most economical option, as short-term storage is sufficient to balance supply and demand.

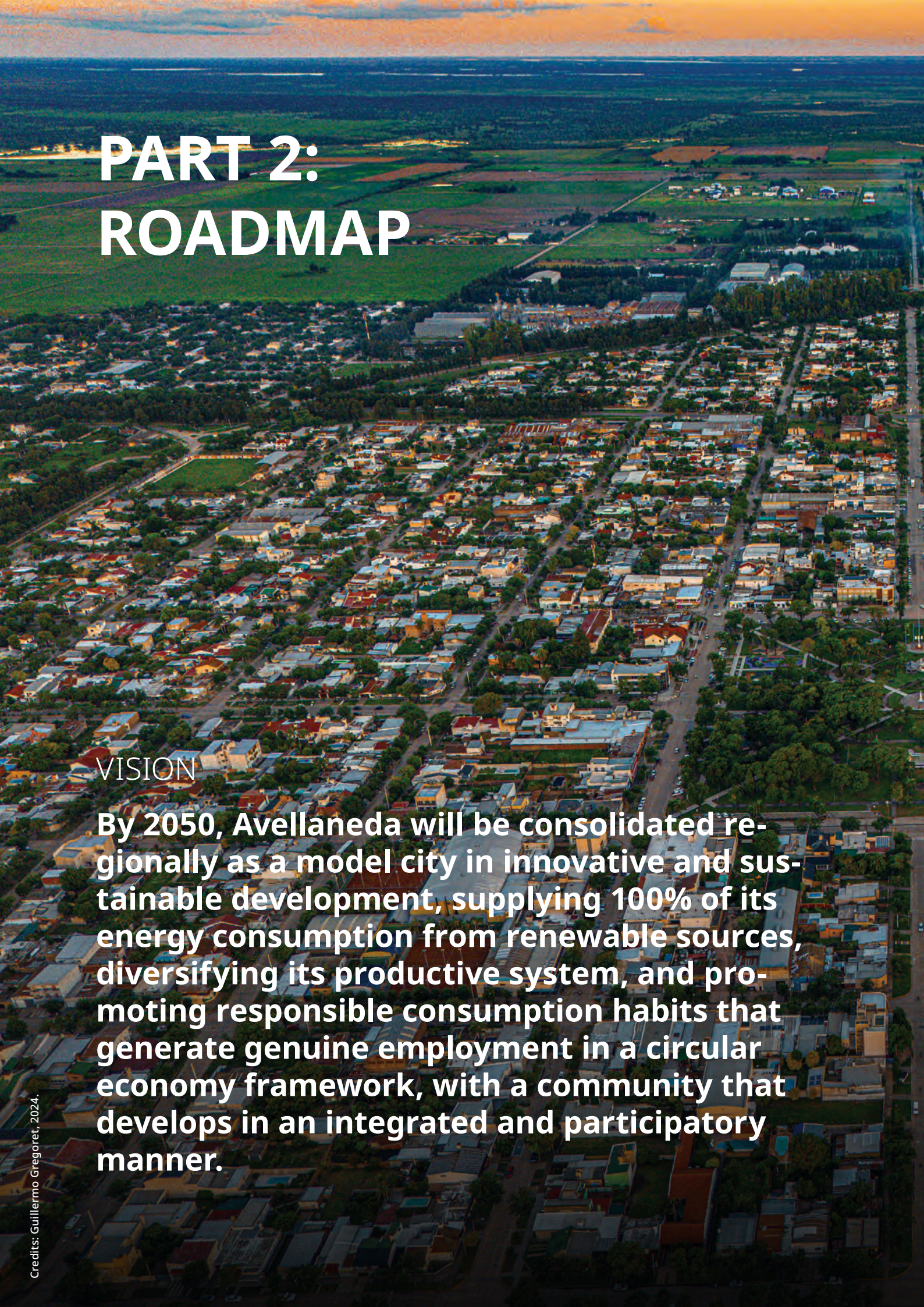
The heating demand in all sectors is 155 GWh and is supplied by three supply technologies: combined heat and power plants at 62%; excess heat from electrolysers at 25%; and heat pumps at 13%. As described above, waste CHPs are not considered due to higher costs compared to biomethane CHP plants. Meanwhile, the cooking demand is covered with 93% biomethane and an electricity share of 7%.

The energy flow diagram of the Fraunhofer Institute, corresponding to the chosen scenario, is presented below.

Graph 4: Energy flow diagram for the baseline scenario



Source: Information retrieved from the report Energy System Modeling Results for Avellaneda, Argentina, Dr. Annette Steingrube, Fraunhofer Institute for Solar Energy Systems, ISE, November 2021.



PART 2: ROADMAP

VISION

By 2050, Avellaneda will be consolidated regionally as a model city in innovative and sustainable development, supplying 100% of its energy consumption from renewable sources, diversifying its productive system, and promoting responsible consumption habits that generate genuine employment in a circular economy framework, with a community that develops in an integrated and participatory manner.

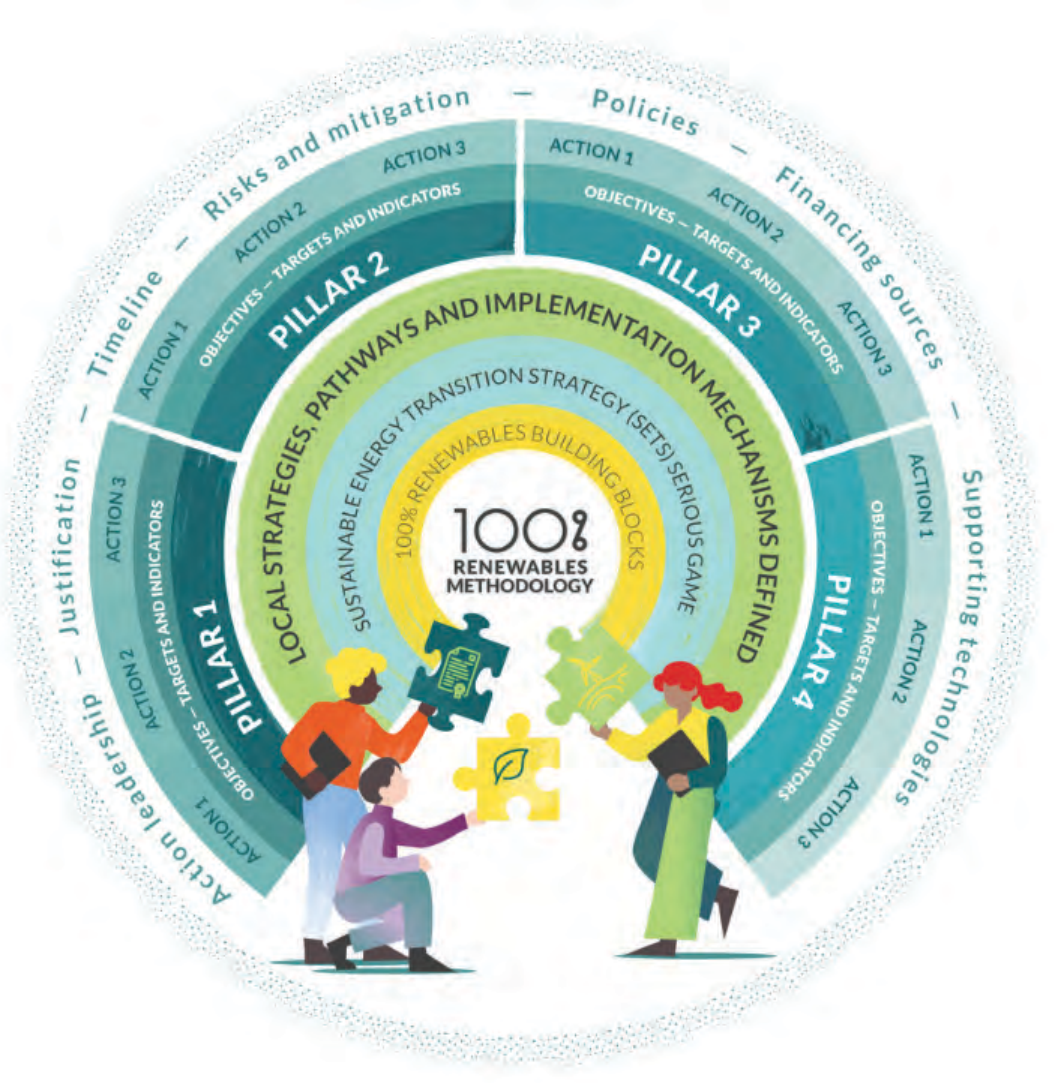
Credits: Guillermo Gregoret, 2024.

The Roadmaps developed as part of the "100% Renewables Cities and Regions Roadmap" project were created using a multi-step methodology based on inclusion (see Figure 4). Through this methodology, the aim is to incorporate the contributions of various types of strategic actors, such as local government officials, government agencies, professionals and experts in the field, civil society, the private sector, and academia.

The methodology proposes that actors identify key priorities through a series of "building blocks" that contribute to the construction of the 100% Renewables Roadmap Framework. Subsequently, a practical exercise, known as a 'serious game', is conducted to generate innovative solutions to the urgent problems faced by the local transition towards sustainable energy. Throughout the Roadmap, reviews of this exercise are conducted for validation and the definitive incorporation of its contents.

In another phase, the involved actors establish the main local strategies through "Axes," under which the various actions and implementation mechanisms are structured to address the issues and objectives identified in each priority sector. Each of the mentioned components must include justification, leadership or responsibility, a timetable, related policies, sources of financing, supporting technologies, potential risks, and their mitigation.

Figure 4: 100%RE Roadmap methodology



The vision, principles, and challenges of Avellaneda's roadmap are detailed below.

2.1. Vision of Avellaneda's 100% Renewable Energy by 2050

By 2050, Avellaneda will be consolidated regionally as a model city in innovative and sustainable development, supplying 100% of its energy consumption from renewable sources, diversifying its productive system, and promoting responsible consumption habits that generate genuine employment in a circular economy framework, with a community that develops in an integrated and participatory manner.

2.1.1. Principles

The principles act as premises that guide all actions of the Roadmap. They are:

- **Individual and collective commitment:** The energy transition will be possible if it is a collective commitment that encompasses domestic, working, and institutional life.
- **Responsible consumption habits:** Adopting a more efficient use of all resources is key to reduce energy requirements and to approach the target of renewable energy supply.
- **Integral participation:** The participation and involvement of the entire community is essential, with special attention to sectors that are in a situation of vulnerability.
- **Education:** Training professionals and incorporating the youngest children and teens in the process of change is essential for its effectiveness and permanence over time.
- **Multilevel governance:** Local policies must necessarily be articulated with other levels of government and international organizations to achieve concurrent synergy and to open up opportunities for cooperation.
- **Perseverance:** There needs to be constant management and implementation of projects towards the energy transition.
- **Collaborative and cooperative work:** 100% RE energy transition will be achieved through cooperation between all parties involved.
- **Transparency:** The process must be clear and transparent, with accurate information on progress, so that stakeholders can be involved in the most appropriate way.

2.2. Sustainable Energy Transition Strategy (SETS) Serious Game

By 2050, a given demand for electricity, heat, and hydrogen will have to be met by a mix of supply technologies. Each technology requires various resources such as financing, land availability or the existence of an enabling public policy framework. These resources, in turn, are distributed among different actors with the capacity to influence an energy transition strategy. The actors are local, provincial, and national governments, universities and research institutes, entrepreneurs, landowners, energy producers and suppliers, civil society organizations, neighbors, among others.

Working with all the actors that make up the ecosystem for the energy transition of the city of Avellaneda is a key aspect of establishing a governance framework that enables the construction of a common vision and a strategy to achieve it. It is also essential to building a broad platform for dialogue, consensus, and social legitimation towards a sustainable future.

To this end, the Sustainable Energy Transition Strategy (SETS) game was implemented involving local government officials and representatives from different sectors of the community[6]. Each of them plays a defined role. Through the perspective and resources of each role, the game seeks to produce a plausible representation of the different dimensions of analysis involved in the construction of a Sustainable Energy Transition Strategy. It is also about how all these aspects intertwine, creating a dynamic that is specific and situated in each particular territory. It is the representation of these dynamics that sheds light on the possible scenarios for decision-making and for the construction of governance, identifying opportunities, strengths, holidays, and drives for change.

The game is played in three rounds. During the first round, players familiarize themselves with the city and identify suitable land for renewable energy projects. During the second round, each player assumes a role in the game and determines the strategy they feel is best suited to meet the city's ultimate energy demand in 2050. In the third and final round, the players collaborate, compare views, and negotiate until an agreement is reached on the sustainable energy system to be achieved.

Resolving the tensions that arise in the debate and the search for a common strategy is the key element of the game, allowing players to learn about local renewable energy sources, the need to create coordinated policies and frameworks, and, in turn, to explore access to public and private sector financing.

The implementation of SETS at the local level emerged as a powerful collective learning tool that allowed us to analyze a problem from different perspectives in dialogue, recognize all the actors involved, improve communication, and facilitate decision-making with a holistic view.

As a result, the game highlighted a clear consensus on the importance of strategically locating energy projects to balance environmental conservation and energy production needs. Specifically, high conservation value areas, such as the eastern district's Ramsar site Jaaukanigás, are protected from energy generation projects due to their biodiversity and ecosystem services. Instead, low-productivity soils and sparsely populated areas are earmarked for wind and solar power projects, minimizing environmental and social impacts. This strategic placement ensures that energy generation does not compromise ecological integrity or urban living conditions, demonstrating a thoughtful approach to sustainable development.

Additionally, the game results indicated a diversified and locally adapted energy matrix as the optimal solution for Avellaneda by 2050. This matrix includes a significant reliance on photovoltaic solar energy and biogas cogeneration plants, capitalizing on local resources and existing infrastructure. While biodiesel emerged as the preferred fuel for heavy transportation due to the territory's agricultural capacity, solar thermal collectors were unanimously agreed upon for heating needs in residential and commercial sectors. This diversification not only addresses the varied energy demands across sectors but also leverages local strengths, such as the agricultural-livestock and agribusiness activities that support biogas production.

The SETS game underscored the necessity of a unified vision and collaborative effort across all stakeholders to drive the energy transition. There was strong agreement on the need for national and provincial policies that support renewable energy adoption, facilitate financing, and enable long-term planning. Additionally, promoting public-private collaboration, distributed energy, circular economy practices, and energy efficiency were identified as crucial actions. This unified approach emphasizes leveraging local capabilities and fostering innovation through science and technology networks, ensuring a sustainable and resilient energy future for Avellaneda.

6 Images of the SETS game and workshop are presented in the Annex 2.

Ultimately, the SETS proved its value as the city of Avellaneda designed and validated the strategy to be implemented to reach 100% renewable energy by 2050.

In terms of usefulness, participants praised the SETS game for its innovative approach to learning, highlighting how the interactive simulation made complex energy transition concepts more accessible. By allowing them to test different strategies in a risk-free environment, the game significantly enhanced their problem-solving skills and understanding of sustainable energy planning. Additionally, the game revealed specific opportunities and challenges that conventional analysis might overlook and fostered widespread consensus among the various stakeholders.

2.3. General timeline

A general chronology of the Roadmap Development is presented in the following outline:

Figure 5: General chronology of the 100%RE Roadmap Development

2.4. Challenges in the deployment of Renewable Energies in Avellaneda

2.4.1. Policy, institutional, and regulatory challenges

The political, institutional, and regulatory challenges for the energy transition are:

- Formulating public policies and programs that encourage continued energy sector investment, particularly to improve infrastructure, expand the capacity of transportation networks, generate renewable energy projects, and increase access to renewable energy technologies for all sectors of society.

- Increasing cooperation between the national and provincial levels on energy efficiency, renewable energy, and distributed generation policies. National, provincial, and local policies and regulations need to be aligned to consolidate multi-level energy governance.

- Acting on certain existing regulatory gaps, namely: design a regulatory framework to promote the use of residual biomass energy from agricultural, livestock, and agro-industrial activities; regulate the Provincial Law on Energy Efficiency Labeling of buildings intended for housing (Law 13903/2019); draft a bill on the Promotion of Sustainable Mobility, which promotes the gradual replacement of fossil fuel vehicles with vehicles powered by renewable and low-carbon sources for private vehicles, cargo, and passenger transportation; and regulate incentives to promote the purchase and use of renewable energy technologies (tax reductions, subsidies, exemptions, creation of funds, etc.).

Ensuring policy predictability is critical to make sure that the private sector, entrepreneurs, and industrialists can invest in renewable energy generation and keep their energy and climate commitments. In this regard, the future status of programs such as the national Renewable Electricity Term Market (MATER), provincial ERA distributed generation program and similar programs that may be launched in the future by different levels of government is essential.

2.4.2. Economic and Financial Challenges

The economic and financial challenges facing the city of Avellaneda are related to national energy constraints.

Argentina has substantial renewable energy resources such as solar in the northwest region of the country and wind in Patagonia and the southern part of the province of Buenos Aires. However, developing renewable projects requires significant investments for their implementation, which implies a flow of capital to finance them. Economic uncertainty, inflation, fiscal deficit, restrictions on the outflow of dollars and multiple exchange rates, among other factors, reduce the possibilities of attracting external investment, making the development of such projects even more difficult.

The tariff policy currently applied with subsidies on the cost of electricity generation does not allow users to access credible information on the cost of generating energy. According to Cammesa's "IN PRINCIPALES MEM" report of August 2022[7], income from energy sales covered only 42.6% of generation costs, which implies that the difference was covered with funds from the National State.

This situation simultaneously encourages higher consumption than would occur without subsidies and discourages renewable energy and energy efficiency projects with less attractive investment conditions.

Distributed generation projects and small renewable self-generation projects are also affected by the lack of access to financing sources. Not all provinces have adhered to the National Law 27.424 on Distributed Generation: according to the "Distributed Generation in Argentina" report of August 2022[8], only 13 provinces have done so. This law allows for tax exemptions at the national level that make it possible to shorten project amortization periods.

Small and medium-sized commercial and industrial enterprises (SMEs), as well as the residential sector, do not have access to financial tools.

Globally, COVID-19 and the war in Ukraine have generated impacts on the renewables sector such as supply chain disruptions, construction delays, and macroeconomic challenges that increase uncertainty about renewable capacity growth.

Within this framework, the main challenges identified are:

1. Reduce administrative barriers to renewable project development and corporate renewable energy supply by simplifying permitting and other administrative procedures.

2. Include renewables in stimulus packages, in particular for projects that offer early opportunities for job creation and economic recovery and can lead to structural benefits in the form of highly efficient and resilient energy systems with lower associated GHGs.

3. Expand the scope and budget of existing support schemes that have already worked to achieve faster results. Priority areas for action could include:

- Introducing targeted financing measures and cost-effective incentives for renewable projects through the use of proven support mechanisms such as auctions, tax incentives that reduce the investment risk for large-scale projects (e.g. solar or wind) and other targeted support schemes for small-scale projects.

- Promoting economic and financial benefits on technological reconversion and EE in the industrial sector, in large industries, as one of the main GHG generators, but also in medium and small industries, with models that adapt to their needs.

- Targeting the labor-intensive construction sector with specific financial incentives, building renovation schemes and/or improvement programs for public buildings, which can support consumer and SME investment in solar PV and solar thermal power. These incentives can also be easily combined with energy efficiency programs.

- Fostering investment and job creation in smart, digital, and resilient energy infrastructure, connecting renewables with efficient services and mobility solutions.

7 Visit: https://microfe.cammesa.com/static-content/CammesaWeb/download-manager-files/VariablesRelevant-esMEM/Resumen%20Principales%20V ariables%20MEM%20Agosto%202022%20web.pdf

8 Visit: https://www.argentina.gob.ar/sites/default/files/reporte_de_avance_agosto_2022.pdf

2.4.3. Technical challenges

At the national level, one of the technical constraints limiting the growth of large-scale renewable projects is the fact that transmission lines are at capacity. The development of renewable energy projects requires significant investments in transmission system expansion to bring energy from source to demand.

The expansion of the national electricity system requires the formulation and implementation of an investment plan for the transmission grid. According to the report "ENERGY SCENARIOS ARGENTINA 2040" (Beljansky et al., 2018), thousands of kilometers of lines with substations and compensators will need to be built by 2030. As of 2018, the country's transmission grid consisted of 30,000 km of high-voltage lines, suggesting the magnitude of the challenge ahead.

At the city level, consideration should be given to whether the infrastructure has available grid capacity for the injection of power by smaller-scale generation plants—e.g. 1-5 MW—that can be connected to the local medium-voltage grid. In this sense, the development of parks close to the locality (near the consumption points) could be feasible. These parks would be of different technologies—such as solar photovoltaic, wind, and biogas—as planned in the energy modeling

The chosen plants should be coordinated with the local electricity distributor (Cooperativa de Servicios Públicos, Sociales y Vivienda de Avellaneda) in order to identify viable injection points for these types of developments.

As for distribution generation systems, the potential for growth is considerable, largely because they are virtually non-existent at the time of this Roadmap's writing. These investments need to be encouraged, which requires cultivating and recruiting suitable companies with specialized manpower to implement them. There are two main constraints: 1) there is no extensive formal training in renewable energy, and 2) because it is a new field, there is no critical mass of experienced local labor. In this sense, it is essential that the municipality actively collaborates with the private sector in the implementation of a pilot project to generate similar initiatives in the future. This collaboration should be complemented by the participation of academic and research entities with experience in the field, such as the National Institute of Agricultural Technology (INTA)[9].

The city has a large potential for biogas generation. This potential comes mainly from livestock farming, as the city raises approximately 730,000 chickens and 30,000 heads of cattle, in addition to municipal organic waste and urban pruning. The city currently has a privately invested biogas plant with a nominal capacity of 6 MW of electrical power, which has been in operation since January 2019.

Another major technical challenge is the incorporation of renewable energies in city transport. Beyond the legal regulations at national and provincial level that will regulate the evolution of the sector, the electricity distribution infrastructure will have to support the development of electric mobility. This challenge will have to be met in coordination with the electricity distribution company, which is responsible for supplying this additional demand through investments in infrastructure.

Finally, there is the need to develop skills and technologies for the future use of green hydrogen that could be deployed in means of transport, such as public or long-distance transport.

2.4.4. Cultural and educational challenges

The transition from conventional resources to renewable energy requires changes in the practices and cultural patterns that have characterized the dynamics of the energy matrix to date. It is essential to encourage new efficient energy consumption behaviors in households, institutions, and businesses, as well as active mobility practices.

9 Visit: https://www.lanacion.com.ar/economia/campo/un-pueblo-de-300-habitantes-produce-su-propia-energia-con-residuos-del-campo-nid05102022/

The main public concerns linked to the energy transition are:

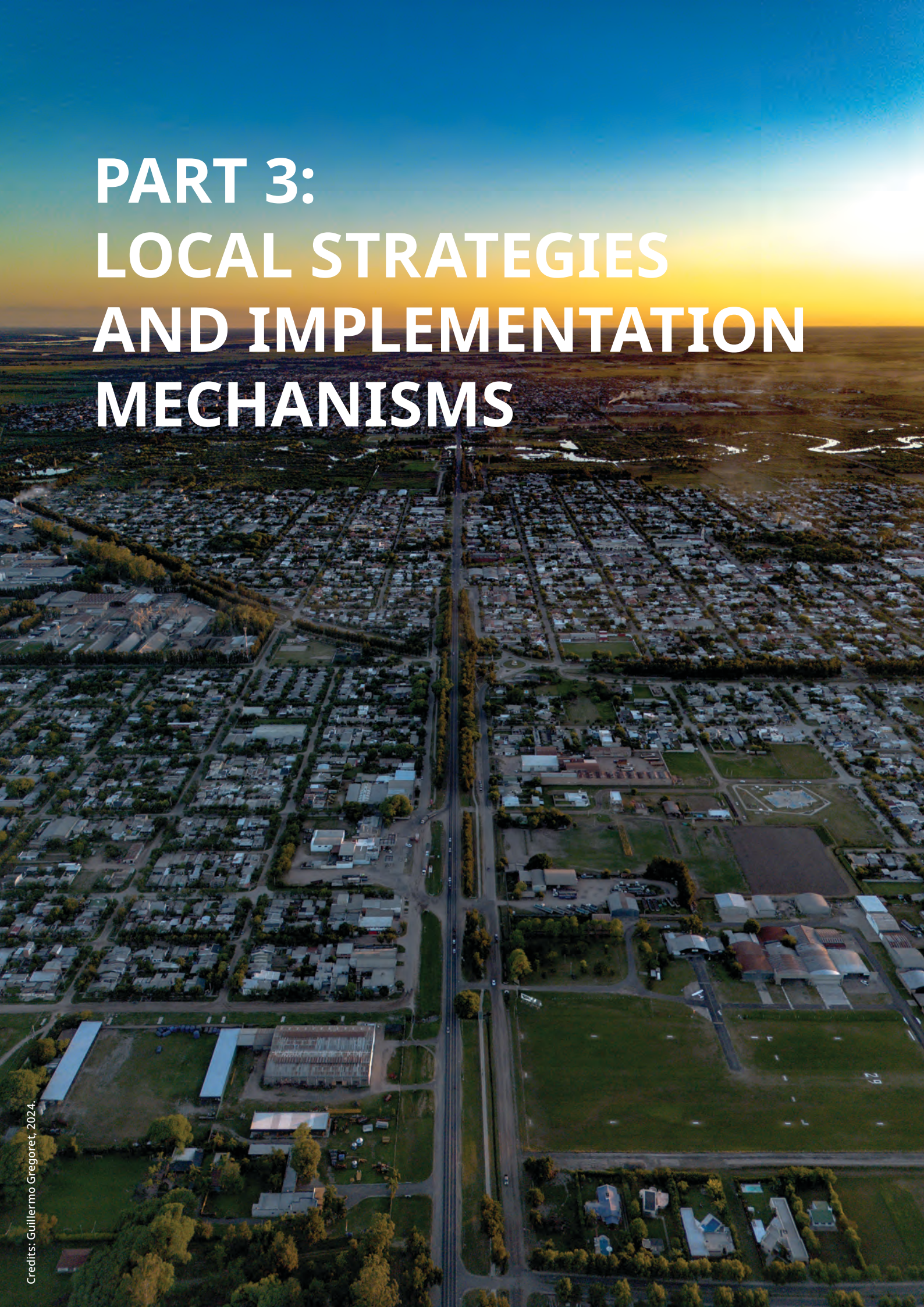
1. Insufficient information on ecological and financial benefits;
2. Inadequate knowledge of clean technologies;
3. Uncertainties about the economic and financial viability of renewable energy installation projects;
4. A lack of clear information available to users on the benefits, installation, maintenance, and return on investment of renewable energy projects.

In addition, the gradual shift from fossil fuels to renewable energy sources requires a skilled workforce. There is a high demand for professionals trained to design, build, operate, and maintain a renewable energy plant, but the supply does not necessarily keep up with this challenge. The shortage of competent technical professionals and the lack of training institutes prevent renewable energy technologies from scaling up.

We need to strengthen professional capacities to develop the skills required to install and operate this type of project. Solving this is a fundamental challenge for the Argentine education system. In this sense, it is essential to link academia (universities, research centers) in the formulation and implementation of policies and programs.

Credits: Guillermo Gregoret, 2024.

PART 3: LOCAL STRATEGIES AND IMPLEMENTATION MECHANISMS



Credits: Guillermo Gregoret, 2024.

3.1. Definition of the axes

Three strategic axes were defined to guide the Roadmap to achieve 100% renewable energy by 2050: Energy Efficiency; Renewable Energy Technologies; Sustainable Mobility.

3.2. Axis 1: Energy Efficiency (EE)

A more efficient use of energy resources is the primary action for reducing GHG emissions and, in turn, allows reducing energy demand to be replaced by renewable sources. This entails considering energy management from the city's overall planning perspective, with a specific focus on both public and private buildings and the productive sector, which includes primary industries, manufacturing, service activities, and commercial operations.

3.2.1. Axis 1: Energy Efficiency (EE) targets

Objective(s) of the Axis

- To promote efficiency and responsible consumption actions in the public, residential, and commercial sectors.
- To promote the efficient use of energy resources in industrial and agricultural production.
- To encourage and promote sustainable, efficient, and inclusive spatial planning and construction.

Linked Sustainable Development Goals (SDGs)

- Goal 7: Ensure access to affordable, secure, sustainable and modern energy for all.
- Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.
  Goal 10: Reduce inequality within and among countries.
- Goal 11: Make cities and human settlements inclusive, safe, resilient
- and sustainable.
- Goal 12: Ensure sustainable consumption and production patterns.
- Goal 13: Take urgent action to combat climate change and its impacts.

Targets	Intermediate targets	Indicators	Actions
30% of energy consumption in municipal public buildings is reduced through energy efficiency measures, compared to the base year (2019), by 2040.	15% of energy consumption in municipal public buildings is reduced through energy efficiency measures, compared to the base year (2019), by 2030.	• Participation of municipal establishments. • Saving energy consumption in the public sector.	**EE.1:** Implementation of a Comprehensive Energy Efficiency Program in the municipal public sector.

Targets	Intermediate targets	Indicators	Actions
30% of energy consumption in the commercial, industrial, and agricultural sector is reduced through energy efficiency measures, compared to the base year (2019), by 2050.	5% of energy consumption in the commercial, industrial, and agricultural sector is reduced through energy efficiency measures, compared to the base year (2019), by 2030. 20% of energy consumption in the commercial, industrial, and agricultural sector is reduced through energy efficiency measures, compared to the base year (2019), by 2040.	Participation of commercial, industrial, and agricultural establishments. Saving energy consumption in the commercial, industrial, and agricultural sectors.or.	**EE.2**: Implementation of an Energy Efficiency Program in the productive sector: commercial establishments, industrial facilities, service activities, and agricultural operations.
20% of per capita energy consumption in the residential sector is reduced through energy efficiency measures by 2050.	5% of per capita energy consumption in the residential sector per capita is reduced through energy efficiency measures, by 2030. 15% of per capita energy consumption in the residential sector is reduced through energy efficiency measures by 2040.	Saving energy consumption in the residential sector.	**EE.3**: Implementation of a comprehensive energy efficiency program in the residential sector.
50% of households in vulnerable conditions incorporate energy efficiency measures by 2050.	10% of households in vulnerable conditions incorporate energy efficiency measures by 2030. 25% of households in vulnerable conditions incorporate energy efficiency measures by 2040.	Effective participation of households in vulnerable conditions in incorporating energy efficiency measures.	

Clarification: Households in vulnerable conditions are those that present at least one indicator of Unsatisfied Basic Needs (UBN). The UBN considers: access to housing, access to health services, access to education, and economic capacity.

3.2.2 Axis 1: Energy Efficiency (EE) indicators

Indicator	Description	Method of calculation	Source / Periodicity	+/-	Baseline	Targets
Effective participation of public buildings to achieve the target	Percentage of public buildings that have implemented energy management actions and energy efficiency measures	No. of public buildings implementing measures/No. of total public buildings x 100	Secretariat of Territorial Planning and Public Works - Municipality of Avellaneda - Annual	+	To be built	100% by 2050
Public sector electricity consumption savings	Public sector electricity consumption savings computed as the difference between electricity consumption and expected consumption in the base year (2019)	Expected consumption according to base year vs. actual consumption, both measured in the same timeframe	COSEPAV/ Secretariat of Territorial Planning and Public Works - Municipality of Avellaneda - Annual	+	To be built according to 2019 value	30% by 2040 (relative to the base year 2019)
Effective participation of industrial, commercial, and agricultural establishments to achieve the target	Percentage of premises industrial, commercial, and agricultural establishments that have implemented energy efficiency measures	Number of industrial, commercial, and agricultural establishments that implemented energy efficiency measures/ Numbe r of total establishments x 100	Secretariat of Territorial Planning and Public Works - Municipality of Avellaneda - Annual	+	To be built according to 2019 value	100% by 2050
Saving of electricity consumption in the commercial, industrial, and agricultural sector	Electricity consumption savings in the commercial, industrial, and agricultural sector computed as the difference between electricity consumption and expected consumption in the base year	Expected consumption according to base year vs. actual consumption, both measured in the same timeframe	Secretariat of Territorial Planning and Public Works - Municipality of Avellaneda - Annual	+	To be built according to 2019 value	30% by 2050 (relative to the base year 2019)

Indicator	Description	Method of calculation	Source / Periodicity	+/-	Baseline	Targets
Saving energy consumption in the residential sector	Estimated savings computed as the difference between per capita consumption and expected consumption in the base year	Expected electricity consumption of the sector per capita according to the base year vs. actual electricity consumption of the sector per capita.	COSEPAV/ Secretariat of Territorial Planning and Public Works - Municipality of Avellaneda - Annual	+	To be built according to 2019 value	20% by 2050 (relative to the base year 2019)
Effective participation of households in vulnerable conditions in incorporating energy efficiency measures	Percentage of dwellings in vulnerable conditions that incorporate energy efficiency measures	Number of households in vulnerable conditions that implemented energy efficiency measures/ Total number of households in vulnerable conditions x 100	COSEPAV/ Secretariat of Territorial Planning and Public Works - Municipality of Avellaneda - Annual		To be built according to 2019 value	50% by 2050

3.2.3. Axis 1: Energy Efficiency (EE) benefits

Environmental:

- Reduction of greenhouse gas emissions.
- Promotion of efficient use of natural resources.
- Lower air and water pollution.
- Better use of energy infrastructure.

Social:

- Creation of local awareness using energy efficiency technologies and practices, thereby driving actions across different sectors.
- Potential sources of local employment and promotion of local innovation.
- Promotion of energy safety during periods of high demand.
- Development of energy efficiency capabilities within the population.
  Reduction of energy poverty by improving the quality and thermal comfort of vulnerable populations.

Economic:

- Savings in energy costs to achieve quality services and comfort in local experiences.
- Creation of conditions for local investment in new or green sectors.
- Stimulus for innovation and technological development and attraction of more investments to the city through the adoption of sustainable practices.

3.2.4. Energy efficiency action EE.1

EE.1: Implementation of a Comprehensive Energy Efficiency program in the municipal public sector.	
Description	This action involves a series of measures to improve energy efficiency and overall energy management in public sector buildings and through public sector outreach activities.
Implementation strategy	**Action scope:** Innovation Center, Municipal Palace, Cultural Center, Auditorium, Production Secretariat Buildings, Edificios Secretaria de Producción, incubation houses, AGENPiA and Coworking headquarters, CCI Arcoiris — Belgrano, new childhood building — Don Pedro, Gapón MSW Classification Plant, Bus Terminal and EEPT n. 451. **Main activities:** • **Baseline:** Construction of a database with measurements of energy variables, both consumption and those affecting it; and identification of improvement opportunities according to energy efficiency categories in the sector, including regulations for improved construction or retrofitting. • **Training:** Training aimed at municipal employees and public officials on energy habits, energy management actions, and energy efficiency implementation. • **Implementation of EE measures:** actions related to habit management and review; actions related to regulations and theoretical/practical material (establishing a regulatory framework for the acquisition of equipment and technologies, drafting technical implementation guides for EE); actions related to measures of medium to low relative investment (partial replacement of luminaires, MRO—maintenance, repairs, and operations—, improvements through plant distribution, among others); actions related to measures of medium to high investment (complete replacement of technology in a sector). • **Innovation Center:** Construction of an Innovation Center, as a model public building for innovation, study object, and demonstrative case of energy efficiency measures applied to buildings. It will be inaugurated at the end of 2024. It is a carbon-neutral building of 750 m^2 covered and 250 m^2 built with energy efficiency and sustainability criteria, meaning that its construction system with insulation, orientation with strategic ventilation points, and a green roof ensures optimized energy consumption. Additionally, the incorporation of photovoltaic panels on its upper roof will generate renewable energy to supply the equivalent of its energy demand, thus mitigating greenhouse gas emissions generated as a result of its operation. It is being constructed within the framework of the URB3iS Project financed by the European Union. The Innovation Center aims to be a point of reference in educational innovation, favoring the formation of leading and innovative citizens, capable of facing the challenges of the future, contributing actively and positively to society. At the same time, it seeks to connect children and young people with innovative training methodologies, providing adequate spaces for the development of creativity, critical thinking, collaboration, and design.

Implementation strategy (2)	**The Center will have several spaces for different types of activities:** • Fab Lab and Robotics Lab: equipped for the development of Learning by doing Workshops; STEAM Workshops; courses and competitions at different levels; Robotics Workshops for teachers • Science Lab: Science corner for children; Science Club; thematic proposals for schools; research methodology and projects. • Digital art room: touch screens, computers, and projection elements; Audiovisual production; body expression and technology. • Immersive experiences: art, science and technology; integration with real scientific and productive production spaces; storytelling and mindfulness. • STEAM educators network: network of educators that promotes the exchange of STEAM practices and projects; collaborative and associative projects between schools and institutions.
Supported technology (PV, wind, hydro etc.)	LED lighting, inverter technology in air conditioning equipment, heat pumps, smart meters, nature-based solutions for building construction, passive and active measures to improve the performance of air conditioning systems, among others.
How it responds to defined goals	The program aims to systematize and accompany the measures required in the sector.
Are there policy linkages at different levels?	National level: • National Program for the Rational and Efficient Use of Energy (PRONUREE), National Decree No. 140/2007.
Estimated GHG reduction	In 2050, 72.18 tCO2e would be avoided by saving 30% of the consumption of municipal buildings compared to the baseline year 2019.
Estimated cost/ resources needed	**Human and/or intangible resources:** • Consulting services. • Hiring of professional experts in EE. • Software for control and monitoring. **Material resources/equipment:** • Controlled mechanical ventilation systems. • Solar panels. • Solar-powered water heaters. • Rainwater retention tanks. • Smart technology.

Estimated timeline (short, medium or long term)	**Timeframes determined individually for each main activity:** • STAGE I: initial diagnosis/baseline, short term (estimated start to 2025). • STAGE II: capacity building/training, short term (estimated start in 2025) • STAGE III: implementation of EE measures/measurement of indicators/ efficiency evaluation: medium term (estimated start in 2026). Deadlines are specified for the implementation of activities in existing buildings. For buildings under construction, Stage I does not apply, nor part of the components contemplated by Stage III, since it is understood that the aspects are taken into account in the construction process. • Existing buildings: Municipal Palace, Cultural Center, Auditorium, Production Secretariat Buildings, incubation houses, AGENPiA and Coworking headquarters, CCI Arcoiris —- Belgrano, Gapón MSW Classification Plant, Bus Terminal and EEPT n. 45. • Buildings under construction: new childhood building —- Don Pedro. Innovation center: opening at the end of 2024. As it is a carbon-neutral building, energy efficiency and sustainability criteria were taken into account in its design.
Possible sources of funding	Cooperativa de Servicios Públicos through its mutual; BID; BIRF; GIZ; GCF; GEF; CCFLA; Economy Ministry / Secretaría de Energía de la Nación; CFI; Banco de la Nación Argentina; Banco de Santa Fe / Banco Santa Fe Foundation; Santa Fe Province Government.
Risks associated with the deployment of the action	Difficulty in accessing management and financial resources to follow up on multiple pieces of information.
Definition of leadership of the initiative	Municipal Executive Department of Avellaneda.

3.2.5. Energy efficiency action EE.2

EE.2: Implementation of an energy efficiency program in the productive sector: commercial, industrial, and service establishment and agricultural establishments.	
Description	The creation of a program that includes the district's productive sector is contemplated, divided into two components: commercial, industrial and service activities, and agriculture and livestock.
Implementation strategy	Main activities for commercial, industrial, and service activities establishments: • **Professional support:** - Generate professional competencies at the local level in terms of EE. - Registration of suitable human resources, agreed and linked to the corresponding professional association. - Workshops to update the knowledge of professionals in the registry on issues related to energy management in primary and secondary sector industries and commercial establishments, • **Regulations:** Readjustment of the existing regulations governing the qualification processes (competence at the municipal level) of commercial and industrial premises, for the incorporation of good energy performance criteria: low carbon emissions, passive energy savings, and optimization of available resources, as qualification requirements. On the other hand, the municipality of Avellaneda has its Urban-Environmental Ordinance Code (COUA, in the Spanish acronym), whose main structure is constituted by the Urbanization and Subdivision Regulations, and the Building Regulations, whose purpose is to ensure that the development of urban areas occurs in harmony with the needs of convenience and the welfare of the population living in them. It is currently being restructured within the framework of the European Union Project URB3iS — Promotion of integrated, inclusive, innovative, and sustainable urban development in the city of Avellaneda and the region, with the general goal of including integrated, inclusive, and environmentally sustainable urban development planning strategies, preserving land use planning by adjusting land use guidelines, regulating new provisions on height, density and building morphologies to promote compact city typology and incorporating environmental and urban resilience criteria. Specifically related to EE, among the actions to be developed is the drafting of a Building Regulation with Energy Efficiency Criteria, with recommendations on new construction parameters related to energy efficiency, thermal comfort, and the incorporation of bioclimatic architecture design systems in public and private buildings. • **Control:** Follow-up and monitoring through preset indicators, the level of compliance with the agreed criteria for the corresponding qualification • **Incentives:** Facilitation of preferential credit lines with low interest rates for energy efficiency projects. Tax incentives such as tax deductions for establishments that invest in energy improvements. Recognition for establishments that achieve certain levels of energy efficiency. • **Supplier linkage network:** Development of a network of suppliers of goods and services; and rental of equipment for measuring variables.

Implementation strategy	Main activities for agricultural establishments: • **Professional support:** - Registering of qualified professionals, certified and linked to the College of Agricultural Engineers and Veterinarians. - Knowledge updating workshops for professionals in the registry on issues related to energy management (electric and thermal) in agricultural production, such as pig farms, poultry farms, feedlots, and agricultural establishments in general. • **Regulations:** The regulations governing the agricultural sector are provincial in nature and exceed the municipal government's competencies; however, the implementation of measures that are within the municipality's reach in terms of technical support, development of good energy practice guides, training and/or provision of resources is envisaged. For the implementation of these initiatives, work will be carried out in coordination with different local stakeholders related to the activity: Mesa de Diálogo Rural, Unión Agrícola de Avellaneda Coop Ltda, rural neighborhoods, INTA EEA Reconquista, among others. • **Incentives:** Facilitation of preferential credit lines with low interest rates for energy efficiency projects. Awarding recognition for those establishments that achieve certain levels of energy efficiency. • **Supplier linkage network:** Development of a network of suppliers of goods and services; and rental of equipment for measuring variables. • **Promotion of technologies in the agricultural sector:** Facilitation of more efficient technologies in systems that require energy, whether electrical or thermal. For example, water collection equipment and supplementary agricultural irrigation, heating in the breeding and rearing stages (pig and poultry farms), alternatives for the treatment and revaluation of effluents.
Supported technology (PV, wind, hydro etc.)	LED lighting, inverter technology in air conditioning equipment, heat pumps, smart meters, nature-based solutions for building construction, passive and active measures to improve the performance of air conditioning systems, among others.
How it responds to defined goals	It is expected that the implementation of EE measures through a Program, carried out by the Municipal Executive Department and the Council of Avellaneda, together with the local productive sector and other actors related to the subject, will allow the generation and execution of a coordinated, coherent and orderly set of interrelated projects, oriented and managed towards the same end, within a set time frame, with broader strategic goals and clear actions to be developed. At the same time, this management tool would allow the search for financing at the provincial, national, and international levels, according to each particular project, thus reducing the risk of inaction due to lack of economic resources.
Are there policy linkages at different levels?	National level: • National Program for the Rational and Efficient Use of Energy (PRONUREE), National Decree N. 140/2007.
Estimated GHG reduction	In the year 2050, 5,722.77 t CO_{2e} would be avoided by saving 30% of the consumption of the commercial, industrial, and agricultural sector with respect to the baseline year 2019.

Estimated cost/ resources needed	• Human and/or intangible resources: • Consulting services. • Hiring of professional experts in EE.
Estimated timeline (short, medium or long term)	**Time periods determined individually for each main activity:** Main activities commercial, industrial and service activity establishments: • Professional accompaniment: short term (estimated start in 2025). • Control regulations and incentives: short term (estimated start in 2026). • Supplier linkage network: short term (estimated start in 2027). Main activities of agricultural establishments: • Professional accompaniment: short term (estimated start in 2025). • Regulations and incentives: short term (estimated start in 2026). • Supplier linkage network: short term (estimated start in 2027). • Promotion of agricultural sector technologies: short-term (estimated start in 2027).
Possible sources of funding	BIRF; BCIE; CDB; GIZ; BEI; GCF; GEF; CCFLA; BICE; Economy Ministry/Energy Secretariat; CFI; Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag; Banco de Galicia y Buenos Aires S.A; BBVA; Banco Santander S.A.; Banco Credicoop Cooperativo Limitado; HSBC; Government of the Province of Santa Fe.
Risks associated with the deployment of the action	Low adherence to the program. High program implementation costs.
Definition of leadership of the initiative	Municipal Executive Department of Avellaneda and Avellaneda Council.

3.2.6. Energy efficiency action EE.3

EE .3: Implementation of a comprehensive energy efficiency program in the residential sector.	
Description	Design and implementation of a comprehensive and inclusive program to reduce energy consumption in the residential sector.

Implementation strategy	• **Awareness campaigns:** dissemination campaigns to the community in general and educational campaigns on rational energy use and energy efficiency, through local media (TV and radio), website and official social networks of the government of Avellaneda, workshops in educational institutions and multipurpose spaces (squares, promenades), participation in mass events in the city. • **Initial diagnosis and follow-up:** analysis of the energy situation in households in vulnerable conditions for the design of approach plans according to energy poverty conditions. • **Financing:** development of soft credit lines and/or fee exemptions for the implementation of EE measures. • **Energy Labeling of Homes:** as detailed in EE .2, the readjustment of the COUA and the drafting of a Building Regulation with Energy Efficiency Criteria also includes the residential sector; in turn, the incorporation of a Housing Labeling System is foreseen and, in parallel, during 2024 and 2025, a specific training on EE in the residential sector aimed at construction professionals is foreseen. • **Incentives:** tax benefits for households that implement EE measures.
Supported technology (PV, wind, hydro etc.)	LED lighting, insulating building materials, more energy-efficient air-conditioning systems, use of solar thermal energy.
How it responds to defined goals	The action promotes the rational use of energy through awareness campaigns, education, and incentives, as well as the implementation of energy efficiency measures in particularly vulnerable homes and households. For the latter, an initial diagnosis is carried out to identify them and specific approach plans are designed for them, including accessible financing and tax benefits.
Are there policy linkages at different levels?	**Provincial level:** • Provincial Law N. 13,903/19 on Energy Efficiency Labeling of properties intended for housing, its regulatory decree N. 458/22 and MAyCC Res. N. 96/22. **National level:** • National Program for the Rational and Efficient Use of Energy (PRONUREE), National Decree N. 140/2007. • National Housing Labeling Program (PRONEV), Resolution N. 5/2023 of the Energy Secretariat of the Ministry of Economy.
Estimated GHG reduction	In 2050, 2,138.45 tCO_{2e} would be avoided by 20% reduction in per capita energy consumption in the residential sector through energy efficiency measures.
Estimated cost / Resources needed	**Human and/or intangible resources:** • Consulting services. • Hiring of professional experts in EE.

Estimated timeline (short, medium or long term)	Deadlines determined individually for each main activity: • Awareness campaigns: short, medium and long term (continuous activity). • Diagnosis and follow-up: short term. • Financing: medium term. • Home Energy Labeling: medium term. • Incentives: medium term.
Possible sources of funding	BIRF; BCIE; AFD; GIZ; BEI; GCF; GEF; CCFLA; Economy Ministry/Energy Secretariat; CFI; Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag; Banco de Galicia y Buenos Aires S.A; BBVA; Banco Santander S.A.; Banco Credicoop Cooperativo Limitado; HSBC; Government of the Province of Santa Fe.
Risks associated with the deployment of the action	High demand for management resources for the development and monitoring of the program. Low adherence to the program.
Definition of leadership of the initiative	Municipality of Avellaneda and civil associations.

3.2.7. Enabling conditions of the Energy Efficiency axis

Action	Enabling conditions			
	Regulation	**Technologies and Studies**	**Governance and accountability**	**Infrastructure and human resources**
EE.1: Implementation of a comprehensive energy efficiency program in the municipal public sector.	-	Energy audits and assessments of public buildings.	Consensus with educational institutions in the region for their contribution to the monitoring of indicators and the development of reports.	Availability of professional specialists to form part of the municipal work team for the follow-up of the planning and execution of tasks.
EE.2: Implementation of an energy efficiency program in the productive sector: commercial, industrial and service, and agricultural establishments	-	Study on the energy performance parameters applicable to the economic activities and items developed in Avellaneda.	Consensus in the City Council for the modification of current regulations to incorporate energy performance criteria in the qualification process. Liaison with the Association of Architects and the Association of Engineering Specialists for their contribution in non-binding technical contributions and updating the register of professionals in the field. Collaboration between the Avellaneda Industrial and Commercial Centre and the municipality to implement the initiative. Consensus and collaboration of industrial, commercial. and agricultural establishments for the elaboration of energy diagnostics; construction of baselines and traceability of detected and executed improvements.	Availability of professional specialists to form part of the municipal work team for the follow-up of the planning and execution of tasks.

Action	Enabling conditions			
	Regulation	Technologies and Studies	Governance and accountability	Infrastructure and human resources
EE.3: Implementation of a comprehensive energy efficiency program in the municipal residential sector.	-	-	Addressing the problem of energy poverty from the different levels of the state (national and provincial) and energy distributors.	Availability of an interdisciplinary team in the municipal work team to address the complex configurations of the social fabric in order to meet their basic needs.

3.3. Axis 2: Renewable energy technologies (RE)

Earlier in the Roadmap, the crucial role of solar, wind, and biomass energy, together with the possibility of incorporating green hydrogen, was highlighted in the path towards an energy matrix based on renewable sources. To advance in this diversification at the local level, it is essential both to develop new technologies to take advantage of the renewable sources available in the region and to adapt existing technologies for everyday use, thus encouraging their mass adoption. Promoting distributed energy generation at the community level is essential to get people actively involved in the energy transition.

3.3.1. Axis 2: Renewable energy technologies (RE) targets

Objective(s) of the Axis

- To promote distributed, community-based, and inclusive energy generation.
- To promote technological innovation for the acquisition and development of renewable energies.
- To bring renewable energy technologies closer to the population, promoting the circular economy and green jobs.

Linked Sustainable Development Goals (SDGs)

- Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all.
- Goal 11: Make cities and human settlements more inclusive, safe, resilient, and sustainable.
- Goal 12: Ensure sustainable consumption and production patterns.
- Goal 13: Take urgent action to combat climate change and its impacts.

Targets	Intermediate targets	Indicators	Actions
The equivalent of 100% of electricity consumption is generated from renewable sources, in annual terms, by 2050.	The equivalent of 60% of electricity consumption is generated from renewable sources by 2030. The equivalent of 80% of electricity consumption is generated from renewable sources by 2040.	Percentage of annual electricity generated by renewable sources in the Avellaneda District.	**RE.1:** Development of a Smart Grid **RE.2:** Implementation of a municipal program to promote distributed generation in the residential, industrial, and commercial sector. **RE.3:** Implementation of circular economy strategies for the energetic use of biomass waste.
100% of the city's thermal requirement is supplied by renewable sources by 2050.	30% of the city's thermal requirement is supplied by renewable sources by 2030. 60% of the city's thermal requirement is supplied by renewable sources by 2040.	Percentage of annual thermal energy supplied by renewable sources in the Avellaneda District.	
100% of the registered waste biomass is used for energy by 2050.	30% of the registered waste biomass is used for energy by 2030. 80% of the registered waste biomass is used for energy by 2040.	Percentage of waste biomass used for energy purposes	

Clarification: "residual biomass" is defined as output streams that are not directly usable and still have some bioenergy potential; these liquid or solid effluents are wastes of industrial and/or agricultural origin.

3.3.2. Axis 2: Renewable energy technologies (RE) indicators

Indicator	Description	Method of calculation	Source / Periodicity	+/-	Baseline	Targets
Percentage of annual electricity generated by renewable sources in the Avellaneda District.	Percentage of electrical energy generated by renewable sources in relation to the total electrical energy consumed in the District of Avellaneda.	Sum of electricity generated from renewable sources divided by total electricity consumption in the year of measurement x 100	Multisectoral body for the implementation of renewable projects (see 3.5. Governance of the Roadmap). - Annual	+	50,6%	100% by 2050

Indicator	Description	Method of calculation	Source / Periodicity	+/-	Baseline	Targets
Percentage of annual thermal energy supplied by renewable sources in the Avellaneda District.	Percentage of thermal energy generated by renewable sources in relation to the total thermal energy consumed in the District of Avellaneda.	Sum of thermal energy generated from renewable sources divided by total thermal consumption in the year of measurement x 100	Multisectoral body for the implementation of renewable projects (see 3.5. Governance of the Roadmap). - Annual	+	To be built	100% by 2050
Percentage of waste biomass used for energy purposes.	Percentage of waste biomass used for energy purposes out of the total recorded waste biomass.	Annual tonnes of waste biomass used for energy purposes divided by total recoverable and recorded waste biomass x 100	Secretariat of Production of the City of Avellaneda - Annual	+	To be built	100% by 2050

3.3.3. Axis 2: Renewable energy technologies (RE) benefits

Environmental

- Promotion of renewable technologies and reduction of GHG emissions.
- Diversification of the local energy matrix.
- Better use of energy infrastructure.
- Reduction of air, soil, and surface and groundwater pollution generated by untreated waste flows.
- Use of by-products from biomass waste processing as fertilizers, thus promoting a closed nutrient cycle.

Social

- Creation of an entrepreneurial culture, potential sources of local employment, and promotion of local innovation. Gender inclusion and community participation.
- Reducing the risk of power outages at times of high demand.
- Contribution to the strategic planning of the city and its inhabitants.
- Capacities installed in the community that strengthen community awareness and participation.

Economic

- Promotion of innovation and local technological development.
- Energy security in all sectors (residential, institutional, commercial, and productive).
- Procurement of electricity from local generators (small urban or production plants) instead of resorting to the wholesale electricity market.
- Reduction of transportation costs and final treatment of certain waste flows.
- Incentive for investment in sustainable projects.

3.3.4. Renewable energy technologies action RE.1

RE.1: Development of a Smart Gird	
Description	A Smart Grid that integrates energy distribution and digital communication technology in a bidirectional flow of electricity and data. The goal of the action is to develop and deploy a network that allows the efficient management of the generation, distribution, and consumption of renewable energy in Avellaneda, ensuring that 100% of electricity consumption is supplied by renewable sources by 2050.
Implementation strategy	Key components for the development of a smart grid: • **Sensor Technologies and Smart Metering (Smart Meters):** installation of smart meters in the main electricity consumption sectors (residential, commercial, industrial), to enable real-time monitoring of energy consumption, detect faults, and optimize energy use. • **Distributed Energy Management and Control:** integrate distributed energy management systems (DERMS) to coordinate generation from multiple renewable sources such as solar, wind and biomass, increasing the efficiency and stability of the grid, allowing for a broader integration of the different sources. • **Energy Storage:** implement energy storage systems, such as high-capacity batteries and advanced storage technologies (e.g., flow batteries and hydrogen storage). Storage of surplus renewable energy allows it to be used during periods of high demand or low renewable generation. • **Advanced Communications Infrastructure:** develop a robust communications infrastructure that enables interconnection and data exchange between all components of the smart grid, facilitating real-time decision making and improving grid resilience and security. • **Artificial Intelligence and Big Data:** implement artificial intelligence algorithms and big data analytics to predict consumption and generation patterns, optimize energy flow, and detect anomalies. • **Incentives and Support Policies:** establish policies and incentive programs to promote the adoption of renewable technologies and smart grids, including subsidies, tax credits and preferential tariffs. This action is necessary to accelerate the adoption of new technologies and ensure a favorable regulatory framework for smart grid development.
Supported technology (PV, wind, hydro etc.)	Photovoltaic solar energy, solar thermal energy, wind power, biomass combustion plants, biogas generation plants, cogeneration plants, green hydrogen, among others.
How it responds to defined goals	The development of a smart grid enables efficient management of the different elements that make up the generation, distribution, and consumption of electricity. This action integrates advanced sensors, energy storage, artificial intelligence, and communication technologies, allowing for efficient, real-time management of renewable energy generation and consumption. By optimizing the flow of energy, storing surpluses, and balancing supply and demand, the smart grid ensures the stability and sustainability of the power grid, facilitating the full integration of renewable energies. In addition, advanced communications infrastructure and AI algorithms improve system predictability and efficiency, ensuring that the electricity provided is fully renewable, reliable, and affordable, aligning perfectly with the target set for 2040.

RE.1: Development of a Smart Gird	
Are there policy linkages at different levels?	**Provincial level:** • Provincial Promotional Regime for Products Related to Non-Conventional Renewable Energies of Santa Fe (Provincial Law N. 12.692/2006) • Renewable Energy for the Environment program (ERA program) of Santa Fe, Provincial Decree N. 1.098/2020, Resolution N. 443/2022 and the incorporation of the Collaborative Distributed Generation System, Resolution 316/2021. • Prosumidores 4.0 Program of the Province of Santa Fe, for the promotion of distributed generation from renewable sources. • Provincial Law N. 14,259/24 for the promotion of distributed generation and adhesion of the Province of Santa Fe to National Law N. 27,424 — Regime for the Promotion of Distributed Generation of Renewable Energy Integrated to the Electric Grid. **National level:** • Regime for the development of technology, production, use, and applications of hydrogen as a fuel and energy vector, National Law 26.123/2006. • National Promotion Regime for the Use of Renewable Energy Sources for Electricity Production, National Law N. 27.191/2015. • Regime for the Promotion of Distributed Generation of Renewable Energy Integrated to the Public Grid, National Law N. 27.424/2017 and National Regulatory Decree N. 986/2018. • National Energy Transition Plan towards 2030, approved by Resolution 517/2023 • National Program for the Rational and Efficient Use of Energy (PRONUREE), National Decree N. 140/2007.
Estimated cost / Resources needed	**Human and/or intangible resources:** • Consulting services. • Hiring of professional experts in RE and smart grids for electricity transmission and distribution. • Legal advice for the formulation of regulations. **Material resources/equipment:** • Materials and technologies related to the installation of a smart grid at local scale: smart meters; sensors and monitoring devices; Energy storage systems; communications infrastructure; management software and algorithms; control and automation equipment; cybersecurity tools.
Possible sources of funding	Local funding; BID; BIRF; BCIE; CDB; AFD; GIZ; BEI; GCF; GEF; CCFLA; BCIE; Economy Ministry/Energy Secretariat; CFI; Banco de la Nación Argentina/Energy Secretariat; Province of Santa Fe/Consejo Federal de Inversiones (CFI); Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag; BBVA; Banco Credicoop Cooperativo Limitado; HSBC; Government of the Province of Santa Fe.

RE.1: Development of a Smart Gird	
Risks associated with the deployment of the action	Lack of access to resources for the acquisition of the necessary technologies for the establishment of the smart grid. High costs of this type of technology in countries with developing economies. Lack of precedents of successful implementation at the national level.
Definition of leadership of the initiative	Municipality of Avellaneda in conjunction with COSEPAV.

3.3.5. Renewable energy technologies action RE.2

RE.2: Implementation of a municipal program to promote distributed generation in the residential, industrial, and commercial sector.	
Description	The program aims to remove barriers to the adoption of renewable energy, enhance local technical expertise, provide financial support, and foster collaboration between public and private sectors, in order to promote the adoption of renewable energy (RE) technologies for distributed generation within the residential, industrial, and commercial sectors of Avellaneda, fostering a sustainable and resilient local energy system.
Implementation strategy	Axes of the program: • **Regulatory:** Promotion, creation, and adequacy of local regulations for the installation of RE equipment for distributed generation, the connection of electric power to the grid, the sale of surplus energy and the implementation of simple formal procedures for approval. If required, the readjustment of the COUA mentioned above will include the basic criteria and guidelines for distributed energy generation in the residential and commercial sector. • **Capacity building:** intensive courses and/or tertiary careers aimed at training technical professionals in electric and thermal energy generation technologies; short training workshops for solar panel and solar water heater installers, talks to the community in general on the economic and environmental benefits associated with the technologies, equipment installation, associated regulations, control, and maintenance. • **Incentives:** Financial incentives such as tax reductions and loans at low rates for the acquisition of technologies by the community, businesses, and small companies. Designation of additional subsidies for the low-income sector of the population. • **Public-private articulation:** with local and regional companies that offer technologies.
Supported technology (PV, wind, hydro etc.)	Photovoltaic solar energy, solar thermal energy, and household and small-scale biodigesters.

RE.2: Implementation of a municipal program to promote distributed generation in the residential, industrial, and commercial sector.	
How it responds to defined goals	This mechanism contributes to fulfill the measures required in the goals regarding the supply of 100% of electric and thermal energy by means of renewable sources, providing a framework for the activities that can be carried out in the commercial and residential sectors. Distributed generation actively involves civil society, placing it at the center of the action and giving it a fundamental role in the transformation of the local energy matrix. In order to be effective, a regulatory framework and a system of incentives or economic benefits that favor the development of this type of projects are needed. Capacity building and public-private articulation foster the existence of technical capacities for the implementation of RE projects in the territory.
Are there policy linkages at different levels?	**Provincial level:** • Renewable Energy for the Environment program (ERA program) of Santa Fe, Provincial Decree N. 1.098/2020. Resolution No. 443/2022 and the incorporation of the Collaborative Distributed Generation System, Resolution 316/2021. **National level:** • Regime for the Promotion of Distributed Generation of Renewable Energy Integrated to the Public Grid, National Law N. 27.424/2017 and National Regulatory Decree N. 986/2018.
Estimated timeline (short, medium or long term)	**Time periods determined individually for each main activity:** • Regulatory: short and medium term. • Capacity building: short and medium term. • Incentives: short and medium term. • Public-private articulation: short and medium term.
Possible sources of funding	BID; BIRF; BCIE; AFD; GIZ; BEI; GCF; GEF; CCFLA; BCIE; Economy Ministry/Energy Secretaria ; CFI; Banco de la Nación Argentina/Energy Secretariat; Province of Santa Fe/Consejo Federal de Inversiones (CFI); Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag.; BBVA; Banco Credicoop Cooperativo Limitado; HSBC; Government of the Province of Santa Fe.
Risks associated with the deployment of the action	Difficulty in accessing financial resources to implement the program. Low adherence to the program. Changes in regulations at provincial or national levels that are unfavorable to distributed generation.
Definition of leadership of the initiative	Municipality of Avellaneda, Secretariat of Public Services and Environment.

3.3.6. Renewable energy technologies action RE.3

RE.3: Implementation of a circular economy strategy for the energetic use of biomass waste.	
Description	The strategy aims to enhance the recovery and energy use of biomass waste within the Avellaneda District, promoting a circular economy model that transforms waste into valuable resources for heat and electricity production. To do so, it seeks to establish a robust framework for identifying, registering, and utilizing waste biomass. Additionally the efficient conversion of biomass should be accomplished through technical and financial support. It is planned to work in coordination with local actors related to the agricultural sector: Unión Agrícola de Avellaneda Coop. Ltda, Mesa de Diálogo Rural, producers of the district, INTA EEA Reconquista.
Implementation strategy	Strategy for waste recovery and energy use of waste biomass for heat and electricity production through: • Definition of types of residual biomass generated within the Avellaneda District to be registered. • Mandatory registration of waste biomass generating establishments and generated volumes. • Registry of circular economy projects and undertakings for the use of waste biomass. • Technical and financial assistance for the implementation of projects for the use of residual biomass.
Supported technology (PV, wind, hydro etc.)	Biomass combustion plants, biogas generation plants, cogeneration plants.
How it responds to defined goals	Creates a concrete structure for the development of biomass resource utilization. It recognizes the actors involved in order to effectively direct capacity building actions and to create synergies in the specific field.
Are there policy linkages at different levels?	Provincial level: • Declaration of provincial interest to the generation and use of alternative or soft energies from the application of renewable sources, Provincial Law N. 12.503/2005. • Provincial Promotional Regime for research, development, generation, production and use of products related to non-conventional renewable energies, Law 12692/2006. National level: • National Promotion Regime for the Use of Renewable Energy Sources for Electricity Production, National Law N. 27.191/2015.
Estimated GHG reduction	In the year 2050, 11,367.94 tCO2e would be avoided by using 100% of the recoverable residual biomass as energy.
Estimated cost / Resources needed	Human and/or intangible resources: • Consulting services. • Hiring of professional RE experts. • Engineering and financial advice.

RE.3: Implementation of a circular economy strategy for the energetic use of biomass waste.	
Estimated timeline (short, medium or long term)	Deadlines determined individually for each main activity: • Definition of types of residual biomass generated within the Avellaneda District to be registered: short term. • Mandatory registration of waste biomass generating establishments and quantities generated: medium and long term. • Registration of projects and undertakings of circular economy for the use of residual biomass: medium and long term. • Technical and financial assistance for the implementation of waste biomass utilization projects: medium and long term.
Risks associated with the deployment of the action	Low adherence on the part of establishments generating biomass waste. Difficulties in accessing funding for project development and implementation. More expensive technologies compared to other alternatives.
Definition of leadership of the initiative	Municipality of Avellaneda, Secretariat for Production
Possible sources of funding	Local funding; BID; BIRF; BCIE; CDB; AFD; GIZ; BEI; CCFLA; BCIE; Economy Ministry/Energy Secretariat; CFI; Banco de la Nación Argentina/Energy Secretariat; Province of Santa Fe/Consejo Federal de Inversiones (CFI); Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag; BBVA; HSBC; Government of the Province of Santa Fe.

3.3.7. Enabling Conditions for the Renewable Energy Technologies (RE) axis

Action	**Enabling conditions**			
	Regulation	**Technologies and Studies**	**Governance and accountability**	**Infrastructure and human resources**
RE.1: Development of a Smart Grid	National and provincial regulations to encourage the development and implementation of Smart Grids.	Feasibility analysis and technical design of the smart grid in the municipality.	Agreement and commitment to collaborative work between COSEPAV and the local government of Avellaneda.	Modernization works through the implementation of technologies in the electric power distribution network.
RE.2: Implementation of a municipal program to promote distributed generation in the residential, industrial, and commercial sector	Agreement between the different levels of government on regulations for the incentive of distributed renewable energy generation.	Study of telemetering points or placement of bi-directional meters.	Collaborative work and consensus building for the formulation and adaptation of regulations with the multi- sectoral body (see 3.5. Governance of the Roadmap). Consensus with the local energy distributor on the distributed generation mechanism to be applied.	-

Action	Enabling conditions			
	Regulation	Technologies and Studies	Governance and accountability	Infrastructure and human resources
RE.3 Implementation of circular economy strategies for the energetic use of biomass waste.	Readjustment of regulations for treatment and disposal of organic waste flows at provincial and local level. Incorporation of the definition of concepts and criteria for the recovery and/or energy use of waste biomass.	Readjustment of regulations for treatment and disposal of organic waste flows at provincial and local level. Incorporation of the definition of concepts and criteria for the recovery and/or energy use of waste biomass. Identification and availability of techniques and technologies associated with waste biomass recovery. Baseline generation (tonnes of residual biomass recorded annually, discriminated by substrate type; energy generation potential by substrate type).	Agreement between the different levels of government on policies aimed at promoting the energy use of waste biomass.	Infrastructure works for the expansion of energy transmission capacity in the electric power system to enable the incorporation of renewable energies.

3.4. Axis 3: Transportation and Sustainable Mobility (TM)

Mobility is a key component in urban planning, due to the particularities of the city, which include connectivity problems with other urban centers, a complex road network, crossed by a national route, and the presence of heavy transportation. At the same time, transportation represents an important component of the city's energy consumption. Therefore, moving towards collective and sustainable transportation is not only essential for urban planning, but also contributes to reducing the sector's energy demand, in addition to other socio-environmental co-benefits such as improved air quality and reduced noise pollution.

3.4.1. Axis 3: Transportation and sustainable mobility (TM) targets

Objective(s) of the Axis

- To incentivize active and low-carbon mobility in urban planning.
- To achieve energy transition in the public passenger transportation fleet and the municipal fleet. To promote renewable energies in private transportation.

Linked Sustainable Development Goals (SDGs)

- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
- Goal 12: Ensure sustainable consumption and production patterns.
- Goal 13: Take urgent action to combat climate change and its impacts.

Targets	Intermediate targets	Indicators	Actions
Increasing the active mobility rate by 50% by 2050, compared to the baseline year (2019).	• Increasing the active mobility rate by 35% by 2030, compared to the baseline year (2019). • Increasing the active mobility rate by 40% by 2040, compared to the baseline year (2019).	Annual active mobility rate.	**TM.1:** Implementation of a Plan for the Promotion of Active and Low Carbon Mobility.
The entire public passenger transportation fleet and municipal fleet are supplied by renewable sources by 2050.	• 30% of the total public fleet is supplied by renewable sources by 2030. • 50% of the total public fleet is supplied by renewable sources by 2040.	Percentage of the fleet supplied with renewable sources.	**TM.2:** Modernization of the public transportation system and municipal fleet for energy transition.
The equivalent of 100% of fuel consumption by private transportation within the District of Avellaneda is generated from renewable sources, in annual terms, by 2050.	• The equivalent of 20% of private transportationfuel consumption is generated from renewable sources, in annual terms, by 2030. • The equivalent of 40% of private transportation fuel consumption is generated from renewable sources, in annual terms, by 2040.	Percentage of transportation energy generated from renewable sources.	**TM.3:** Implementation of a municipal program for the incorporation of renewable energies in the transportation sector.

3.4.2. Axis 3: Transportation and sustainable mobility (TM) indicators

Indicator	Description	Method of calculation	Source / Periodicity	+/-	Baseline	Targets
Annual active mobility rate	Measure of transportation of persons or goods by non- motorized means, based on human physical activity	Number of journeys made by non- motorized means divided by total number of journeys	Volumetric census carried out by the local government - Annual	+	To be built	50% by 2050
Percentage of the fleet supplied with renewable sources	Measure of public and municipal transportation fleets that are fuelled by renewable sources	Measure of public and municipal transportation fleets that are fuelled by renewable sources Number of combustion vehicles (fossil fuel) divided by total number of vehicles in the public passenger transportation fleet and municipal fleet x 100	Local government survey - Annual	+	To be built	100% by 2050

Indicator	Description	Method of calculation	Source / Periodicity	+/-	Baseline	Targets
Percentage of transportation energy generated from renewable sources	A measure of energy generated within the district specifically for the transportation sector	Sum of transportation energy generated from renewable sources divided by the total energy consumption of the transportation sector in the year of measurement x 100	Local government survey and Agency set up by RE.1 Action - Annual	+	To be built	100% by 2050

3.4.3. Axis 3: Transportation and sustainable mobility (TM) benefits

Environmental

- Reduction of GHG emissions and local pollutants.
- Reduction of environmental noise.
- Reduction of metallic elements, ferroalloys, and waste oils and lubricants to be treated.
- Reduction of air, soil, and surface and groundwater contamination generated by untreated waste flows.
- Use of by-products resulting from the processing of biomass waste as fertilizers, thus promoting a closed nutrient cycle.

Social

- Contribution to the strategic planning of the city and its inhabitants.
- Traffic management.
- Improved air quality with health benefits for the population.
- Improved road safety, promoting inclusion and accessibility, allowing different social groups, regardless of age, gender, income, and abilities to access safe and sustainable mobility.
- Potential sources of local jobs and promotion of local innovation. Promotion of access to sustainable transportation.

Economic

- Development of local commerce through increased accessibility and improved street infrastructure, and reduced health costs due to reduced air pollution and traffic accidents.
- Increased local sovereignty in terms of food sources.
- Stimulation of technological innovation and development of local industry.
- Transition to more sustainable fleets generates greater efficiency in operation, reducing costs in the medium/long term.
- Procurement of energy from local generators (small urban or production plants) instead of resorting to the electricity and wholesale fuel market.
- Reduction of transportation costs and final treatment of certain waste flows.
- Diversification of the local economy through the production and use of renewable energies.
- Promotion of local tourism by facilitating sustainable active mobility to various points of interest in the city and surrounding areas.

3.4.4. Transportation and sustainable mobility action TM.1

TM.1: Implement a Plan for the Promotion of Active and Low-Carbon Mobility	
Description	The Plan aims to encourage active mobility and reduce the use of private individual motorized transport. It seeks to improve travel conditions in a sustainable, safe, and efficient manner in the urban environment to promote active mobility.
Implementation strategy	Axes of the Plan for the Promotion of Active and Low Carbon Mobility: • **Diagnosis:** analysis of the current situation regarding mobility, urban infrastructure, and transportation systems; expansion of the urban sprawl and territorial surveys of population growth and urbanization; conduction and analysis of origin-destination surveys with a gender and diversity perspective. • **Hierarchization of networks:** hierarchization of the urban, rural, and metropolitan road network to ensure greater road safety by identifying main and secondary roads, eliminating dangerous crossings, improving access and creating exclusive transit areas for pedestrians and cyclists. • **Infrastructure:** implementation and development of infrastructure that promotes safe active mobility (pedestrians, cyclists); pedestrian paths, networks of bicycle lanes/bike paths; incorporation of ramps and paths to ensure accessibility and safety at corners for all types of users; bicycle nurseries, vegetation and afforestation, street furniture; revitalization of the downtown area. • **Open streets:** encouraging the occupation of public spaces with open roads for pedestrians and cyclists on regular days, with closure of vehicular traffic.To this end, temporary and planned interventions such as pilot tests are anticipated before making permanent changes (car-free days, bike-only streets), in order to gather information, opinions, and suggestions from the residents/users of the road network themselves. • **Education and awareness:** meanwhile, and considering the results of the initial diagnosis, conduct road safety education campaigns in schools, public institutions, and community spaces to promote a safer and more sustainable environment for all.
Supported technology (PV, wind, hydro etc.)	Non-motorized means of transportation.
How it responds to defined goals	It stands as the regulatory framework that enables the increase of active mobility and the decrease in energy demand for the transportation sector. It creates the necessary infrastructure for the development of low-carbon transportation. It plans actions related to active and low-carbon mobility, structuring the city's activities and goals.
Are there policy linkages at different levels?	**Provincial level:** • Sustainable Mobility Policy of the Province of Santa Fe, Provincial Law N.13.857/2019 National level: **National level:** • National Sustainable Transportation Plan 2030, approved by Resolution 635/2022

TM.1: Implement a Plan for the Promotion of Active and Low-Carbon Mobility	
Estimated GHG reduction	Included in action TM.3 calculation.
Estimated cost / Resources needed	**Human and/or intangible resources:** • Consulting services. • Hiring of professional experts in mobility and urban planning. • Hiring of labor for the creation of new infrastructure and improvement of existing infrastructure. **Material resources/equipment:** • Materials for the construction and maintenance of infrastructure.
Estimated timeline (short, medium or long term)	**Deadlines determined individually for each main activity:** • Diagnosis: short term. • Hierarchization of networks: short, medium, and long term. • Infrastructure: short, medium and long term. • Open streets: short, medium, and long term.
Possible sources of funding	BIRF; CAF; FONPLATA; BCIE; AFD; GIZ; BEI; GCF; GEF; CCFLA; Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag; BBVA; Banco Credicoop Cooperativo Limitado; HSBC; Government of the Province of Santa Fe.
Risks associated with the deployment of the action	Delays in construction timelines due to lack of infrastructure funding. Some community members may resist change, especially if it involves restricting certain vehicular access or changes to urban infrastructure that affect them.
Definition of leadership of the initiative	Municipality of Avellaneda.

3.4.5. Transportation and sustainable mobility action TM.2

TM.2: Implementation of a Modernisation Plan for the public transportation system and municipal fleet for the energy transition.	
Description	The Plan's goal is to reduce the use of liquid fuels derived from hydrocarbons in public and municipal transportation by using renewable energies and/or renewing fleets with new technologies.

TM.2: Implementation of a Modernisation Plan for the public transportation system and municipal fleet for the energy transition.	
Implementation strategy	• **Supply program:** market analysis, development, and implementation of a commercial biodiesel program in the short, medium, and long term to guarantee supply. • **Dispenser qualification:** obtaining qualification and permits for the installation of biodiesel outlets and electric charging terminals to supply public transportation. • **Financing and business model:** planning of business models and financing management to guarantee, on the one hand, the transition to fleets supplied with renewable energies and, on the other, that the costs of the transition do not have to be absorbed by passengers. • **Tenders:** incorporation of fleet diversification criteria with renewable technologies in public transportation bidding processes. • **Multimodal transfer:** generation of a multimodal transfer station for public transportation supplied 100% by RE. • **Infrastructure Development:** creating biodiesel infrastructure and electric vehicle charging stations in strategic sectors of the district, both in urban and rural areas, where energy consumption by the municipal vehicle fleet is higher. • **Education:** implementing training programs for drivers, mechanics, and other associated actors in the chain, with the aim of informing them about new technologies and the maintenance requirements of each type of equipment.
Supported technology (PV, wind, hydro etc.)	Biodiesel, bioethanol, electromobility, and green hydrogen.
How it responds to defined goals	It contributes to the energy transition towards 100% renewable energy in the transportation sector, encouraging local development towards new technologies. It strengthens a public transportation system aimed at discouraging the use of private motorized transport. It promotes and structures the modal shift of mobility in the territory. It creates the necessary infrastructure for the development of low-carbon transportation.
Are there policy linkages at different levels?	**Provincial level:** • Promotion of the industrialisation of electric vehicles and vehicles with alternativetechnologies for urban and peri-urban mobility in Santa Fe, Provincial Law N.13.781/2018 • Santa Fe Provincial program for the Sustainable Use of Biofuels, Provincial Law 14.010/2020 **National level:** • Regime for the development of technology, production, use and applications of hydrogen as a fuel and energy vector, National Law N. 26.123/2006. • Regulation and promotion regime for the sustainable production and use of biofuels, National Law N. 26.093/2006. • National Biofuels Regulatory Framework, National Law N. 27.640/2021 • Additional Transitional Mandatory Biodiesel Cut-Off Scheme (National Decree N.330/2022). • National Sustainable Transportation Plan 2030, approved by Resolution 635/2022.

TM.2: Implementation of a Modernisation Plan for the public transportation system and municipal fleet for the energy transition.	
Estimated GHG reduction	Included in action TM.3 calculation.
Estimated cost / Resources needed	**Human and/or intangible resources:** • Consulting services. • Hiring of professional experts in mobility. • Manpower for construction and maintenance of infrastructure associated with sustainable mobility. **Material resources/equipment:** • Electric, low carbon or more fuel efficient vehicles. • Charging terminals for electric vehicles. • Biofuel outlets.
Estimated timeline (short, medium or long term)	**Timeframes determined individually for each main activity:** • Supply program: short, medium, and long term. • Dispenser qualification: medium and long term. • Financing and business model: medium term. • Bidding: medium and long term. • Multimodal transfer: long term.
Possible sources of funding	BIRF; CAF; CDB; FONPLATA; BCIE; AFD; GIZ; BEI; GCF; GEF; CCFLA; Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag; BBVA; Banco Credicoop Cooperativo Limitado; HSBC; Government of the Province of Santa Fe.
Risks associated with the deployment of the action	Delays in implementation due to difficulties in accessing finance, technology and resources. Limited supply of vehicles, which can hinder the transition. More expensive technologies compared to alternatives. Grid dependencies, as well as overloads if there is no investment in power line infrastructure. In addition, there are increased risks from handling electricity.
Definition of leadership of the initiative	Municipality of Avellaneda and Cooperativa de Trabajo de Choferes y Minibuses Avellaneda Limitada.

3.4.6. Transportation and sustainable mobility action TM.3

TM.3: Implement a municipal program for the incorporation of renewable energy in the transportation sector.	
Description	The program aims to promote the production of renewable energies to reach the equivalent of fuel consumption in the District of Avellaneda. According to the district's potential, priority is given mainly to the production of biofuels and secondly to the generation of electricity. In addition, the program seeks to encourage the progressive adoption of vehicles powered by renewable energies in private transportation.

TM.3: Implement a municipal program for the incorporation of renewable energy in the transportationsector.	
Implementation strategy	Axes of the program: • **Diagnosis:** conducting a market, demand, and feasibility analysis to determine the optimal percentage of biofuel and electricity production from renewable sources. • **Research and development:** promoting collaboration between academic institutions, research centers, and local companies to accelerate the development of renewable energy technologies applied to mobility. • **Development of executive projects:** generation of bankable executive projects for renewable energies suitable for transportation. • **Financing and investment:** dialogue roundtables to promote the participation of local, national, and international investors interested in supporting initiatives that promote the production of biofuels and electricity for transportation. • **Incentives and facilitations:** creating a favorable environment for the installation of commercial premises and/or companies dedicated to the generation and sale of electric furniture within the district; making it easier for citizens to recharge their vehicles through the installation of electric charging terminals in strategic locations in the city; generating an agreement between the public and private sectors, banks, and mutual financing entities for the acquisition of loans at preferential rates favorable for the purchase of electric vehicles. • **Logistics hub:** creation of a logistics hub for a heavy transportation station and promotion of the last urban mile for cargo vehicles under 9 tons, supplied 100% by RE. • **Infrastructure:** development of renewable energy pumps, with their corresponding qualifications, strategically distributed throughout the city. At the same time, integrating renewable energy into conventional transportation and mobility infrastructure, such as installing solar panels on the roofs of bus stops to supply the electricity consumption of users (lighting, screens, USB charging) and/or power the lighting of the road network with renewable energy technologies.
Supported technology (PV, wind, hydro etc.)	Photovoltaic solar energy, wind power, biodiesel, bioethanol, green hydrogen.
How it responds to defined goals	It responds to the goals set by prioritizing the production of biofuels and electricity from renewable sources to cover fuel consumption in the district of Avellaneda, seeking to achieve 100% use of renewable energies for private transportation by 2050. In addition, it actively promotes the adoption of vehicles powered by renewable energies, facilitating their financing and encouraging the installation of the necessary infrastructure, such as energy pumps and electric recharging points. With a focus on collaboration between institutions, development of executive projects and attraction of investors, the program is positioned as a catalyst for the transition to a more sustainable and environmentally friendly mobility in the city. It also contributes to the goals set out in the EE and RE axis.

TM.3: Implement a municipal program for the incorporation of renewable energy in the transportation sector.	
Are there policy linkages at different levels?	Provincial level: • Promotion of the industrialisation of electric vehicles and vehicles with alternative technologies for urban and peri-urban mobility in Santa Fe, Provincial Law N.13.781/2018 • Santa Fe Provincial program for the Sustainable Use of Biofuels, Provincial Law14.010/2020 National level: • Regime for the development of technology, production, use and applications of hydrogen as a fuel and energy vector, National Law N. 26.123/2006. • Regulation and promotion regime for the sustainable production and use of biofuels, National Law N. 26.093/2006. • National Biofuels Regulatory Framework, National Law N. 27.640/2021 • Additional Transitional Mandatory Cut-off Regime for Biodiesel (National Decree No. 330/2022).
Estimated GHG reduction	In 2050, 118,453.19 tCO2e would be avoided by using renewable energies to replace the equivalent volume of fossil fuels used for transportation.
Estimated cost / Resources needed	**Human and/or intangible resources:** • Consultancy service. • Hiring of professional experts in Mobility and EE. • Hiring of labor for the creation of new infrastructure and improvement of existing infrastructure. **Material resources/equipment:** • Materials for construction and maintenance of infrastructure. • Technology related to renewable energy and its application to the field of mobility.
Estimated timeline (short, medium or long term)	**Deadlines determined individually for each main activity:** • Diagnosis: short term. • Research and development: short, medium, and long term. • Development of executive projects: medium and long term. • Financing and investment: medium and long term. • Logistics hub: long term. • Infrastructure: medium and long term.
Possible sources of funding	Public funding (national and provincial level) and private funding (international and corporate); BIRF; CAF; FONPLATA; BCIE; AFD; GIZ; BEI; GCF; GEF; CCFLA; Economy Ministry/Energy Secretariat; CFI; Province of Santa Fe; Banco de la Nación Argentina; Banco de Santa Fe/Banco Santa Fe Foundation; Banco Coinag; BBVA; Banco Credicoop Cooperativo Limitado; HSBC; Government of the Province of Santa Fe.

TM.3: Implement a municipal program for the incorporation of renewable energy in the transportation sector.	
Risks associated with the deployment of the action	Delays in infrastructure construction due to difficulties in accessing finance or technologies.
Definition of leadership of the initiative	Municipality of Avellaneda, Avellaneda Industrial Park

3.4.7. Enabling Conditions for the Transportation and sustainable mobility axis (TM)

Action	**Enabling conditions**			
	Regulation	**Technologies and Studies**	**Governance and accountability**	**Infrastructure and human resources**
TM.1: Implementation of a Plan to Promote Active and Low-Carbon Mobility	Existence of national and provincial regulations promoting the transition from fossil fuel use to multimodal and sustainable mobility.	Background information for the elaboration of the Plan.	The different levels of government (national, provincial, and local) agree on policies to promote sustainable mobility.	Bicycle paths, pedestrian walkways, multimodal stations.
TM.2: Implementation of a Modernization Plan for the public transportations system and municipal fleet for the energy transition	Existence of national and provincial regulations promoting the transition from fossil fuel use to multimodal and sustainable mobility.	Availability of renewable technologies in the transportation sector. Presence of suppliers of new technologies applied to the energy transition in the transportation sector.	Consensus and governance of the action with the Cooperativa de Trabajo de Choferes y Minibuses Avellaneda Limitada.	Refueling stations for alternative fuels (biofuels, electric power, etc.)-
TM.3: Implementation of a municipal program for the incorporation of renewable energy in the transportation sector	Existence of regulations promoting the transition from fossil fuels to alternative fuels nationwide.	Availability of renewable technologies in the transportation sector. Presence of suppliers of new technologies applied to the energy transition in the transportation sector.	The different levels of government (national, provincial and local) agree on policies to promote sustainable mobility.	-

3.5. Governance of the Roadmap

Governance is an essential pillar for the effective implementation of the Roadmap to a 100% renewable Avellaneda by 2050. A robust and participatory governance model ensures coordination and cooperation among all relevant stakeholders, maximizes the efficient use of resources, and facilitates data-driven and evidence-based decision making. Adequate governance promotes transparency, accountability, and inclusive participation, key factors for the long-term sustainability and success of the project.

3.5.1. Multi-sectoral body for the implementation of the Roadmap

3.5.1.1. Composition of the multi-sectoral body

The multi-sectoral body will be a formal body composed of a variety of key stakeholders, including:

- Local government representatives
- Local energy supplier
- Private sector (businesses and entrepreneurs)
- Civil organizations
- Innovation sector and academy (research centers, universities)
- Investors

The composition of the body will guarantee gender parity and inclusion, ensuring that all voices and perspectives are heard and considered in decision-making.

3.5.1.2. Role, responsibilities, and activities of the multistakeholder body

The multi-sectoral body will play a key role in the implementation of the Roadmap towards a 100% renewable Avellaneda by 2050. Its main responsibilities and activities include:

Promotion and supervision of Renewable Energy (RE) projects.

- Identification and promotion: identify and promote RE generation projects in Avellaneda, focusing on applicable technologies such as solar photovoltaic, wind, hydrogen and biomass.
- Project evaluation: evaluate and follow up on RE investment projects, ensuring their technical and financial feasibility.
- Generation of dialogue roundtables: facilitating collaboration between public and private actors through dialogue roundtables to develop joint projects.

Financing

- Search for financing: search for financing for renewable energy, energy efficiency, and sustainable mobility technology projects.
- Dissemination of opportunities: disseminate information on available local, provincial, national, and international funding sources and advise interested parties on the application process.

Regulatory development

- Regulatory analysis: analyze and disseminate local, provincial, and national regulations that regulate the implementation of the roadmap and technological projects.
- Formulation of local regulations: propose and formulate local regulations that support the creation and performance of the multisectoral organization, providing a solid legal framework.

Promotion of innovation and green jobs

- Collaboration with academic entities: work collaboratively with scientific-academic institutions for the study and development of new renewable technologies.
- Technology development: develop and evaluate emerging technologies in the regional market, including the construction of pilot plants and demonstration projects.
- Promotion of green jobs: promote the creation of green jobs by linking labor supply and demand and disseminating job opportunities in the renewable energy sector.

Diagnosis and Planning

- Diagnostics: perform detailed diagnostics to assess the potential and feasibility of technologies in Avellaneda.
- Strategic planning: develop strategic plans for the implementation of RE projects, based on the diagnostics performed.

Roadmap indicator monitoring

- Monitoring the implementation of the Roadmap: measurement and monitoring of the indicators corresponding to the axis of implementation of Renewable Energy technologies: percentage of annual electric and thermal energy generated by renewable sources in the district of Avellaneda. The continuous monitoring and evaluation of these indicators will allow the multi-sectoral body to adjust strategies and actions to ensure that Avellaneda effectively advances towards its goal of being a model city in sustainability and renewable energy by 2050.

3.5.1.3. Monitoring and reporting Activities

The multi-sectoral body will report to the local government and the community on its activities, including:

- Quarterly reports on project progress and achievement of objectives.
- Periodic meetings to review progress, solve problems, and adjust strategies.
- Citizen participation and consultation to ensure transparency and community inclusion in the process.

PART 4: INVESTMENT STRATEGIES AND FINANCIAL INNOVATIONS

Credits: Guillermo Gregoret, 2024.

The success of an initiative aimed at achieving 100% renewable energy generation depends to a large extent on the availability of adequate financial resources.

In this context, an analysis has been carried out to identify the main potential financiers, considering both international and national entities that can provide financial and technical support for the implementation of initiatives in this area.

The table below highlights those key actors that can collaborate to ensure the viability and success of the projects identified in this Roadmap. From multilateral organizations to local government agencies, each of these potential backers represents an opportunity to obtain the necessary resources and move towards a more sustainable and resilient future for the community of Avellaneda.

International funding sources				
Funding agencies	**Outreach**	**Lines of financing**	**Additional info.**	**Actions and applicable projects**
Inter-Americ an Developmen t Bank (IDB)	Social inclusion and equality, productivity and innovation, economic integration, gender equality and diversity, climate change and environmental sustainability, and institutional capacity and rule of law.	Loans, grants, technical assistance.	https://www. iadb. org/en	Actions related to the Renewable Energy Technology axis (RE.1, RE.2 RE 3)
International Bank for Reconstruction and Development (IBRD)	Health and well- being, gender equality, clean water and sanitation, sustainable cities, underwater life.	Loans, guarantees, risk management products, advisory services.	https://www. worl dbank.org	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2 EE.3, RE.1, RE.2, RE.3, TM.1, TM.2, TM.3).
Development Bank of Latin America (CAF)	Cities, digital transformation of the state, energy, equity and social inclusion, external relations, education, environment and climate change, gender, impact assessment, productive transformation, productivity, research, social innovation, transport, telecommunications and ICTs, urban mobility observatory, water.	Loans, structured finance, financial consultancy, guarantees and warranties, partial guarantees, share ownership, treasury services, technical cooperation, credit lines.	https://www. caf.c om/en/	Actions related to Transportation and Sustainable Mobility (TM.1, TM.2, TM.3).
Financial Fund for the Development of the La Plata Basin (FONPLATA)	Transportation and logistics, environment, governance, housing and urban development, health and education, financial services, energy, water and sanitation, production.	Loans, credit operations, non-reimbursable government resources. Bankable Cities Climate Projects.	https://www. fonpl ata.org/ en	Actions related to Transportation and Sustainable Mobility axis (TM.1, TM.2, TM.3).
Central American Bank for Economic Integration (CABEI)	Environmental and social sustainability, sustainable competitiveness, regional integration, human development and social inclusion, gender equality	Loans, lines of credit, guarantees and letters of credit, leases, pre- investment and technical cooperation, equity and quasi-equity investments, derivative instruments	https://www. bcie. org	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.2, EE.3, RE.1, RE.2, RE.3, TM.1, TM.2, TM.3).

International funding sources				
Funding agencies	**Outreach**	**Lines of financing**	**Additional info.**	**Actions and applicable projects**
European Investment Bank (EIB)	The European Investment Bank is the lending branch of the European Union. Multilateral financial institution for climate finance.	Loans, shares, guarantees, advisory services.	https://www.eib.o rg/en/index.htm	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.2, EE.3, RE.1, RE.3, TM.1, TM.2, TM.3)
Green Climate Fund (GCF)	Health and well- being, gender equality, clean water and sanitation, sustainable cities, underwater life.	Loans, guarantees, risk management products, advisory services.	https://www.worldbank.org	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2 EE.3, RE.1, RE.2, RE.3, TM.1, TM.2, TM.3).
Development Bank of Latin America (CAF)	Climate change mitigation projects: agriculture, forestry and other land use, efficiency of buildings, cities, industries and appliances, reduction of GHG emissions due to energy and transport. Climate change adaptation projects: resilience of ecosystems and ecosystem services, resilience of health, food and water safety, resilience of infrastructure and the built environment, resilience of livelihoods of vulnerable communities. Cross-cutting projects.	Loans, grants, co- financing	https://www.gree nclimate.fund/	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, TM.1, TM.2, TM.3)
Global Environment Facility (GEF)	Biodiversity, climate change mitigation, land degradation, international waters and chemicals and waste.	Grants and co-financing.	https://www.theg ef.org/	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, ER.1, ER.2, TM.1, TM.2, TM.3)
Cities Climate Finance Leadership Alliance (CCFLA)	Adaptation and resilience, energy efficiency, land use and nature-based solutions, low-carbon technology, renewable energy, transport/mobility, urban and green public space, water and waste sanitation.	Project preparation facilities, Financial Toolbox Task Force, Action Group on Enabling Frameworks.	https://www.cities climatefinance.or g/	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, RE.3, TM.1, TM.2, TM.3).

National funding sources				
Funding agencies	**Outreach**	**Lines of financing**	**Additional info.**	**Actions and applicable projects**
Banco de Inversión y Comercio Exterior S.A. (BICE)	Sustainability (export of value chains, renewable energies, women leaders)	Loans (private sector)	https://www.bice.com.ar/eng/	Actions and projects related to Energy Efficiency (EE.2) and Renewable Energy Technologies (RE.1, RE.2, RE.3).
Ministerio de Economía/ Secret aría de Energía de la Nación	Program for the Rational and Efficient Use of Energy (PROUREE) in Public Buildings; Program for the Interconnection of Photovoltaic Systems to the Electricity Grid in Urban Environments (IRESUD); Project for Renewable Energies in Rural Markets (PERMER); Project for the Promotion of Energy Derived from Biomass (PROBIOMASA); Clean Energy for Vulnerable Homes and Communities Project;	Project preparation funds, technical cooperation, lines of credit.	https://www.argentina.gob.ar/economia/energia/programas-y-proyectos	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, RE.3,TM.3).
Banco de la Nación Argentina / Secretaría de Energía	Fund for the Distributed Generation of Renewable Energies (FODIS)	Loans	https://www.boletinoficial.gob.ar/pdf/aviso/primera/176726/20230719	Actions and projects related to the Renewable Energy Technologies and Transportation and Sustainable Mobility axes (ER. 1, ER. 2, ER. 3,TM.3).
Province of Santa Fe/ Consejo Federal de Inversiones (CFI)	Renewable Plan: a credit plan created by the Government of the Province of Santa Fe together with the Federal Investment Council to facilitate access to renewable energies to neighbors, single-payers, SMEs and micro-SMEs in the province of Santa Fe, promoting the energy transition in Santa Fe.	Loans.	https://www.santafe.gov.ar/index.php/web/content/view/full/244386/(subtema)/234948	Actions and projects related to the Renewable Energy Technologies and Transportation and Sustainable Mobility axes (RE.1, RE.2, RE.3,TM.3).
Banco de la Nación Argentina	Its Board of Directors adheres to the National Strategy for Sustainable Finance (ENFS), implementing practices that promote the integration of economic, social and environmental factors in its business, both strategically and institutionally, as well as in its commercial, financial and investment operations. Within this framework, it is expected to promote the mobilization of resources to catalyze public and private investments that contribute to achieving economic and social goals within the framework of the SDGs, including the country's climate change mitigation and adaptation goals within the framework of the Paris Agreement.	Project preparation facilities, Financial Toolbox Task Force, Action Group on Enabling Frameworks.	https://www.citiesclimatefinance.or g/	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, RE.3, TM.1, TM.2, TM.3).

National funding sources				
Funding agencies	**Outreach**	**Lines of financing**	**Additional info.**	**Actions and applicable projects**
Banco de Santa Fe/ Banco Santa Fe Foundation	Sustainable Initiatives Open Program: to encourage the planning and execution of sustainable social projects, oriented to environmental issues, such as Biodiversity, Natural Resources, Native Forests, Sustainable Cities and Communities, Consumerism, Climate Change and Environmental Pollution, among others, that benefit and promote the local development of communities and regions.	Loans, shares, guarantees, advisory services.	https://www.fundacionesgrupopetersen.com.ar/iniciativas-sustentables	All actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, RE.3,, TM.1, TM.2, TM.3).
Banco de Galicia y Buenos Aires S.A.	Sustainable financing: loans for sustainable businesses and/or triple impact projects.	Loans (private sector).	https://www.galicia.ar/empresas/financiaciones/financiamiento-sostenible	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies axes (EE.2, EE.3, RE.2.)
Banco Bilbao Vizcaya Argentaria (BBVA)	Loans for sustainable purposes: financing for the purchase of sustainable goods and services in terms of Renewable Energy, Sustainable Mobility, Energy Efficiency, Mortgages, Agriculture and Health and Education.	Loans (private sector).	https://www.bbva.com.ar/personas/productos/prestamos/personales/sustentable.html	All actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, RE.3,, TM.1, TM.2, TM.3).
Banco Santander S.A.	Sustainable line: Loans for investment in sustainable development for companies and SMEs whose purpose is to reduce the environmental impact of their activity. Sustainable Energy, Environment, Technology and Green.	Loans (private sector).	https://www.santa nder.com.ar/banc o/online/pymes-a dvance/financiaci on/prestamos-sustentables#sect_fold	Actions and projects related to the Energy Efficiency axis (EE.2, EE.3)
Banco Credicoop Cooperativo Limitado	Credits for environmental care: Sustainable Development, Triple Impact or B Corporations, and Energy Efficiency and Renewable Energy.	Loans (private sector).	https://www.bancocredicoop.coop/empresas/pymes/creditos/prestamos-medio-ambiente	Actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes

National funding sources				
Funding agencies	**Outreach**	**Lines of financing**	**Additional info.**	**Actions and applicable projects**
HSBC Holdings plc.	Specific line of sustainable financing: green loans, green leasing, Social loans.	Loans (private sector).	https://www.business.hsbc.com.ar/es-ar/campaigns/sustentabilidad/financiamiento-sustentable	All actions and projects related to the f Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, RE.3,, TM.1, TM.2, TM.3).
Government of the Province of Santa Fe	Non-reimbursable contributions, transfers and financing to municipalities and communes: fund for minor works, advances of co-participation, financing of projects for municipalities and communes, Program for the Development of Metropolitan Areas of the Interior (DAMI, in the Spanish acronym).	Credits, grants, co-financing	https://www.santafe.gob.ar/index.php/web/content/view/full/217127/(subtema)/217070	https://www.santafe.gob.ar/index.php/web/content/view/full/217127/(subtema)/217070 All actions and projects related to the Energy Efficiency, Renewable Energy Technologies and Transportation and Sustainable Mobility axes (EE.1, EE.2, EE.3, RE.1, RE.2, RE.3,, TM.1, TM.2, TM.3).

4.1 Leveraging innovative financing

Financing is an important factor to support the achievement of 100% renewable energy use. Funding renewable energy projects in Avellaneda will involve a multifaceted approach that incorporates various financial mechanisms and instruments, and sustainability considerations. Public funds from the local, provincial, or national budget may have many limitations starting from allocation, prioritization, and administration. As a follow-up, we need to mobilize investment funds for business entities and the private sector. However, the effectiveness of these investments will only be optimal if accompanied by supportive government policies. An independent study from the Climate Policy Initiative (2018)[11] provides insights and recommendations for optimizing public funds to leverage greater private investment, including in the form of providing more attractive RE electricity buying and selling rates (including implementing competitive tenders to encourage competition healthy in RE development), development of blended finance and PPP instruments, as well as expansion of government guarantee instruments in RE development.

11 Visit: https://www.climatepolicyinitiative.org/publication/energizing-renewables-in-indonesia-optimizing-public-finance-levers-to-drive-private-investment/

In addition to existing funding sources, namely public funds and private funds or business entities, it is imperative to diversify the mode and source of funding that is further supported by innovation and digitization. Below are some financing concepts, strategies, and instruments that not only have the potential to make achieving 100% renewable energy and net-zero emissions feasible and viable but also speed up the transition at the local level:

- **Crowdfunding:** Crowdfunding platforms can be utilized to raise small amounts of money from a large number of people. This approach can engage local communities and individuals in supporting renewable energy projects and benefit from the initiative. Crowdfunding campaigns can highlight the social and environmental benefits of the projects to attract a wider audience.

- **Renewable Energy Certificates (RECs):** RECs represent the environmental attributes of renewable energy generation. Investors or project developers can sell or trade these certificates to individuals or organizations looking to offset their carbon footprint. Developers can generate additional revenue from RECs for their renewable energy projects.

- **Carbon Market Financing:** Participation in carbon markets, such as cap-and-trade systems, allows organizations and project owners to buy and sell carbon credits. By reducing greenhouse gas emissions, renewable energy projects in Avellaneda could generate carbon credits that can be sold to entities seeking to offset their emissions.

- **Results-Based Financing (RBF):** RBF involves paying for the actual outcomes of a project rather than the inputs. RBFs involve rewarding projects based on the achievement of predetermined results. In the context of renewable energy, RBFs could be structured to reward successful project development, energy generation, or emission reductions.

- **Environmental, Social, and Governance (ESG) Investing:** ESG investing involves considering environmental, social, and governance factors in investment decisions. Renewable energy project owners and developers in Avellaneda with their projects that demonstrate strong ESG credentials may attract investments from individuals, funds, or institutions looking to align their portfolios with sustainable and socially responsible initiatives.

- **Impact Investments:** Impact investors seek financial returns alongside measurable social and environmental impacts. Funding from impact investors can be directed towards renewable energy projects in Avellaneda, emphasizing positive outcomes for the local community and the environment.

- **Social Impact Incentives:** Governments, international organizations, or philanthropic entities may offer incentives for projects that have a significant positive impact on society. These incentives could come in the form of grants, subsidies, or low-interest loans, encouraging the development of renewable energy infrastructure.

Diversifying funding sources reduces dependency on a single channel and enhances financial resilience. Innovation in financing models, such as green bonds or sustainability-linked loans, can attract investors. Digitization of financing processes can streamline transactions, reduce costs, and increase transparency. It is important to conduct thorough market research, engage with local stakeholders, and align projects with national and regional energy policies and goals. Additionally, establishing partnerships with local communities, government agencies, and international organizations can enhance the success and sustainability of renewable energy initiatives in the region.

Achieving the goal of 100% renewable energy in Avellaneda by 2050 is certainly an ambitious endeavor that calls for substantial and invigorating efforts. Combining various financing mechanisms, emphasizing environmental and social sustainability, and leveraging digital tools can create a robust and diversified funding strategy for renewable energy projects. Recognizing the complexities involved, it becomes evident that collaboration among stakeholders is key for success. Embracing a positive perspective, the municipality of Avellaneda can play a pivotal role in orchestrating a harmonious multilevel governance approach.

In the journey towards a sustainable future, Avellaneda is poised to take on a more proactive stance. The upcoming years present an opportunity for the local government to pioneer progressive change by implementing encouraging financial policies, innovative mechanisms, and effective instruments. This transformative process will be tailored to the unique jurisdiction and authority of Avellaneda.

In essence, this strategic push towards multilevel action and involving multiple levels of governments not only acknowledges the challenges but embraces them as opportunities for positive transformation. As Avellaneda embarks on this journey, it sets the stage for a future where renewable energy is not just a goal but a thriving reality, fostering sustainable development and environmental well-being.

PART 5: Synthesis and future prospects

The city of Avellaneda can reach 100% Renewable Energy by 2050, but the implementation path requires political commitment, clear and stable regulatory frameworks, technological development, renovation works, and access to financing sources.

As experience shows, consensus is needed between different levels of government (municipal, provincial, and national) on the need for energy transition as a tool for just climate action and greenhouse gas emission reductions that support the Nationally Determined Contributions (NDCs) and the Sustainable Development Goals of the 2030 Agenda.

It requires governance work that articulates all stakeholders, involving governmental, social, business, neighborhood, academic and research actors, among others. These alliances are essential to achieve agreements and convergences to drive the energy transition to 2050.

The Roadmap faces the challenge of sustaining its coherence and sustainability over time, i.e. achieving a degree of strategic integration between national, provincial, and local government that enables coordination and complementarity to contribute to renewed governance.
This transition should, in principle, be accompanied by an efficient use of energy that promotes a significant reduction in energy demand and facilitates the transition to energy supply from renewable sources.

It must also be strongly accompanied by technological innovation and investment in infrastructure. We need a consolidated market with suppliers of energy efficiency technologies, sustainable mobility, and renewable energy generation, with specialized labor and professionals, as well as the development of infrastructures that ensure the electricity transmission capacity that allows the injection of renewable energies into the grid.

In addition, the generation of new normative and regulatory frameworks is required for the deployment of action with predictability and legal certainty. Financial resources must be guaranteed to implement renewable energy projects that articulate the convergence of the public and private sectors. The search for financing must take into account existing restrictions—contractual, procurement or guarantees—and the conditions of access to the resource—financial costs, term and value of payment, operation and maintenance costs, or the need for initial investment or counterpart—in order to establish relevant courses of action.

The transition path requires an information and monitoring system that develops easily measurable and quantifiable follow-up indicators to assess the scope of the impacts and results achieved, as well as to help guide action in the medium and long term.

International cooperation has made it possible to accelerate the transition agenda in the city of Avellaneda, not only strengthening its planning capacity, but identifying strategic projects and the main means of implementation.

Other suggestions and guidelines applicable to this Roadmap and similar planning processes can be found in the documents of "Local Policy Recommendations" and "National Policy Recommendations for Energy Transition in Local Governments, which complement this study, framed within the 100% Renewables Cities and Regions Roadmap initiative.

6. References

Aliano et al. (2019): Movilidad Sustentable: Desafíos para la Argentina. Edited by Climate Transparency.

Beljansky et al. (2018): Escenarios energéticos Argentina 2040. Coincidencias y divergencias sobre el futuro de la energía en Argentina. Editado por el Centro de Estudios de la Actividad Regulatoria Energética (UBA), Instituto Tecnológico de Buenos Aires (ITBA).

CAMMESA. (2022). Indicadores principales MEM. Argentina. Available at: https://microfe.cammesa.com/static-content/CammesaWeb/download-manager-files/VariablesRelevantesMEM/Re sumen%20Principales%20Variables%20MEM%20Agosto%202022%20web.pdf.

Calvetti et al. (2021). Energías Renovables en Argentina Desafíos y Oportunidades en el contexto de la transición energética global. Cámara Argentina de Energías Renovables. Available at: https://www.dropbox.com/s/bn00s4xgzokf1sr/informe_ERA_2021_ares%20vf.pdf?dl=0

ICLEI — Gobiernos locales para la sostenibilidad. (2020). 100% Renovables - Hoja de Ruta de Ciudades y Regiones: Análisis de Escenario Energético y Stakeholders — Argentina. São Paulo, Brasil. Available at: https://renewablesroadmap.iclei.org/resource/argentina-energy-situational-and-stakeholder-analysis/

ICLEI — Gobiernos locales para la sostenibilidad. (2020). 100% Renovables - Hoja de Ruta de Ciudades y Regiones: Informe de estado inicial — Argentina. São Paulo, Brasil. Available at: https://renewablesroadmap.iclei.org/resource/avellaneda-initial-status-report/

Ley Provincial Etiquetado de eficiencia energética de inmuebles destinados a vivienda. Ley 13903/2019, October 31st, 2019, (Santa Fe, Argentina).

Marco Regulatorio de Biocombustibles. Ley Nacional Nro. 27640/2021, August 4th, 2021 (Argentina).

Marco Regulatorio de Generación Distribuida. Ley Nacional 27.424, February 22nd, 2019 (Argentina).

Ortegón et al. (2005). Metodología general de identificación, preparación y evaluación de proyectos de inversión pública. Serie manuales CEPAL; 39, 1-246. Available at: https://repositorio.cepal.org/handle/11362/5608

Ortegón et al. (2015). Metodología del marco lógico para la planificación, el seguimiento y la evaluación de proyectos y programas. Available at: https://repositorio.cepal.org/bitstream/handle/11362/5607/S057518_es.pdf

Plan Nacional de Transporte Sostenible. Resolución N. 635/2022, September 28th, 2022 (Argentina).

PRODEM. (2018). Informe Prodem. Avellaneda.

Reporte "Generación Distribuida en Argentina — August 2022". Available at: https://www.argentina.gob.ar/sites/default/files/reporte_de_avance_agosto_2022.pdf

Steingrube y Reggentin (2021): Reporte Energy System Modeling Results for Avellaneda, Argentina. Fraunhofer Institute for Solar Energy Systems, ISE. Freiburg, Germany. Available at: https://renewablesroadmap.iclei.org/resource/avellaneda-energy-modelling-report/

Siles, R. y Mondelo E. (2019). Gestión de Proyectos. 5th edition. Available at: https://connectamericas.com/sites/default/files/articles_files/PM4RGu%C3%ADaDeAprendizajeES2019.pdf

7. Annexes

7.1. Annex 1. Energy Sector Policies and Plans

Name	Level of government	Category	Brief description	Synergy with the plan	Identified needs
Law N. 25.019/1998	National	Regulatory framework	National Wind and Solar Energy Scheme	It is aligned with renewable energy actions; solar and wind power generation.	Promotion of renewable energies
PERMER Project	National	Regulatory framework	Renewable Energy in Rural Markets Project	It is aligned with renewable energy implementation actions.	Rural electrification and energisation
Law N. 26.190/2006	National	Regulatory framework	National Promotion Scheme for the use of renewable energy sources	It is aligned with renewable energy actions	Promotion of renewable energies
Law N. 26.123/2006	National	Policy	The development of hydrogen technology, production, use, and applications as a fuel and energy carrier is declared to be of national interest.	It is aligned with renewable energy and sustainable mobility actions.	Promotion of new renewable technologies.
Law N. 27.191/2015 and Regulatory Dec. N. 531/2016	National	Regulatory framework	National Promotion Regime for the Use of Renewable Energy Sources. Amended N. 26190	It contributes to the incorporation of renewable energies in the electricity matrix.	Increasing the share of renewable energy sources in the electricity matrix.
Law N. 27.424/2017	National	Regulatory framework	Regime for the Promotion of Distributed Generation of Renewable Energy integrated to the Public Electricity Grid.	It is aligned with actions to implement distributed energy generation	Promotion of distributed generation.
Law N. 27.640/2021	National	Regulatory framework	Regulatory framework for biofuels, processing, storage, marketing, and blending.	It aligns actions for energy transition in the transportation sector.	Promotion of biofuels.
Dec. N. 140/2007.	National	Regulatory framework	National Program for Rational and Efficient Energy Use (PRONUREE) to improve energy efficiency in the different energy consuming sectors.	It aligns energy efficiency actions in the different energy consuming sectors.	Improving energy efficiency.

Name	Level of government	Category	Brief description	Synergy with the plan	Identified needs
Dec. N. 32/2018 (amending Dec. N. 779/1995)	National	Regulatory framework	It incorporates electric vehicles into the regulations governing the use and activities related to transport.	It aligns energy efficiency actions in the different energy consuming sectors.	Improving energy efficiency.
Res. 281-E/2017	National	Regulatory framework	Term Market Regime for Electricity from Renewable Sources (MATER).	It is aligned with renewable energy actions	Promotion of renewable energies.
Law N. 12.503/2005	Provincial	Regulatory framework	It declares renewable energy sources to be of provincial interest.	It is aligned with renewable energy actions.	Promotion of renewable energies.
Law N. 12.692/2006	Provincial	Regulatory framework	Provincial promotional scheme for non-conventional renewable energies.	It is aligned with renewable energy actions.	Promotion of renewable energies.
Law N, 12.956/2008	Provincial	Regulatory framework	Provincial promotional scheme.	It is aligned with renewable energy actions.	Promotion of renewable energies.
Law N. 13.903/2019	Provincial	Regulatory framework	Energy efficiency labeling of residential buildings.	It is aligned with energy efficiency actions.	Improvement of energy efficiency.
ERA Program	Provincial	Policy	Renewable Energy for the Environment Program.	It is aligned with actions to promote distributed generation.	Promotion of distributed and community generation.
Dec. N. 1565/2016	Provincial	Regulatory framework	Prosumers program	It is aligned with renewable energy actions.	Promotion of renewable energies.
Dec. N. 1098/2020	Provincial	Regulatory framework	It seeks to promote the industrialization of electric vehicles. Creation of the Provincial Plan to Promote Electric Mobility.	It is aligned with sustainable mobility actions.	Boosting electric mobility.
Joint Provincial Resolution between the Secretary of Transportation N. 002/19 and the Secretary of State for Energy	Provincial	Regulatory framework	Regulation of the use of Biodiesel.	It is aligned with sustainable mobility actions.	Boosting mobility from biofuels.

Name	Level of government	Category	Brief description	Synergy with the plan	Identified needs
Ordinance N. 1904/2018 — Ordinance N. 1962/2020	Municipal	Regulatory framework	Energy Efficiency.	It is aligned with energy efficiency actions.	Improving energy efficiency.
Autonomy, labor equity, and environmental commitment in rural areas	Municipal	Plan	Construction of the building with solar panel system for energy saving and efficiency.	It is aligned with energy efficiency and renewable energy actions.	It is aligned with energy efficiency and renewable energy actions. Improving energy efficiency in rural areas and developing renewable energies for self-consumption.
Photovoltaic park in the Municipal Industrial Park	Municipal	Project/ policy	The goal is to inject energy into the SADI through renewable sources.	It is aligned with renewable energy actions.	Developing the generation of electricity from renewable energies for injection into the SADI.
Efficient lighting plan (PLAE)	Municipal	Plan	The goal is to implement 97% of the urban and rural road network with LED technology. The aim is to achieve 45% savings in energy consumption for public lighting. Target: 100% by December.	It is aligned with energy efficiency actions.	Improving energy efficiency in street lighting.
Efficient lighting in green spaces	Municipal	Project/ policy	The goal is to implement 14% of the city's green spaces with LED technology. Target: 100% by June 2020 (established by municipal ordinance).	It is aligned with energy efficiency actions.	Improving the energy efficiency of public lighting in the city's green spaces.
Energy efficiency in public	Municipal	Project/ policy	It aims to reduce energy consumption by December 2019: 25%. Target of 50%	It is aligned with energy efficiency actions.	Improving energy efficiency in public buildings.
Solar stations	Municipal	Plan	The project involved the installation of five solar charging stations for mobile phones and hot water in order to raise awareness of these technologies applied to everyday life.	It is aligned with renewable energy actions.	Need to raise public awareness of the importance of renewable energies to mitigate the impacts of climate change.
Ordinance N.1965	Municipal	Regulatory framework	The municipality ratifies and declares its interest in the 100%RE Regions and Cities Roadmap project.	It is aligned with sustainable mobility actions	Boosting mobility from biofuels.

Source: Based on the Initial Status Report and the work carried out in the "Public Policy Dialogue" workshops.

7.2. Annex 2. Workshop "Strategies for Energy Transition: Avellaneda, model city in Argentina of the 100% RE Project" - Implementation of the SETS game.

Image 1. María Julia Reyna, Executive Director of ICLEI Argentina; Gonzalo Braidot, Mayor of Avellaneda; Dionisio Scaprin, National Senator (left). Audience First Session (right).

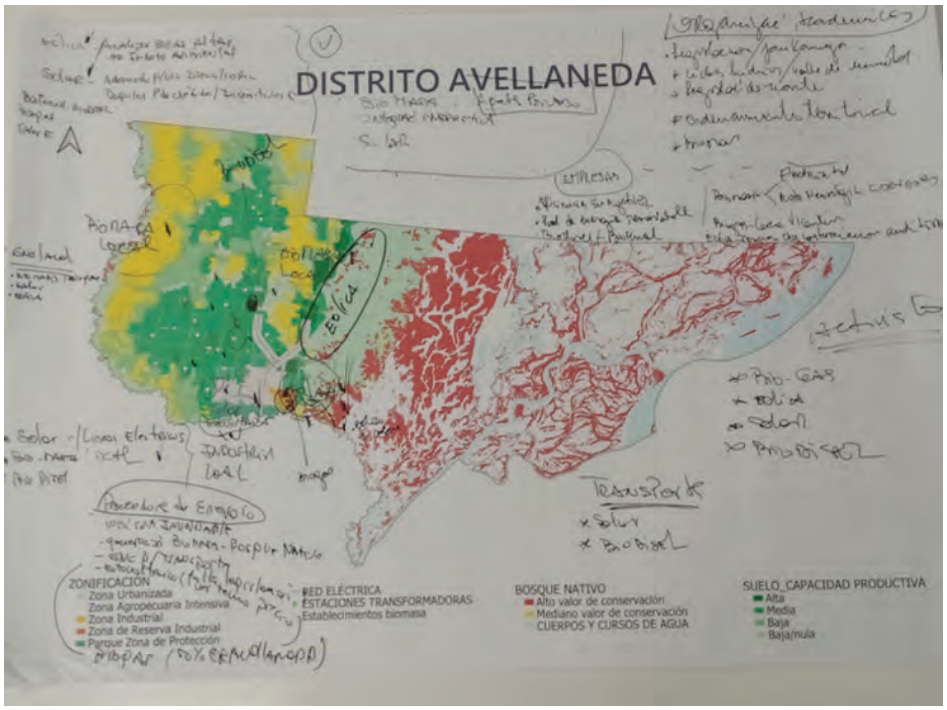


Image 2. Map of Avellaneda with interventions.

Image 3. Stakeholders analyzing the territory (left) and debating in the 2nd round (right).

Credits: Guillermo Gregoret, 2024.

100% RENEWABLES CITIES & REGIONS ROADMAP

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The Roadmap for 100% Renewables Cities and Regions project is implemented by ICLEI – Local Governments for Sustainability and funded by the Federal Ministry of Economic Affairs and Climate Action (BMWK) through the International Climate Initiative (IKI).

https://renewablesroadmap.iclei.org/

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Supported by:

Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

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