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CLIMATE CITY CONTRACT

M100

Mirror Mission
Cities Hub
Romania



2035



CLIMATE CITY CONTRACT

Alba Iulia Municipality



DISCLAIMER

This document, which was developed through the Mirror Mission Cities Hub Romania, draws inspiration, both in its structure and content, from the methodology developed by the European Commission for elaborating the documents pertaining to the Climate City Contracts (the Climate Neutrality Action Plan, Investment Plan and Commitments) for the 112 cities which officially participate in the EU Mission for Climate-Neutral and Smart Cities.

By aligning the M100 Climate City Contract with the model set forth by the European Commission, we aim to ensure that this document is in line with European strategic priorities and directives regarding the transition towards climate neutrality.

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ACRONYMS

ABBREVIATIONS AND ACRONYMS	DEFINITION
AFOLU	Agricultural, Forestry, and Land Use
AP	Action Plan
CO2	Carbon Dioxide
COSME	Programme for the Competitiveness of Enterprises and SMEs
CRF	Common Reporting Format
CSR	Corporate Social Responsibility
CTP	Compania de Transport Public (Public Transport Company)
DG	Directorate General
PIEE	Energy Efficiency Improvement Programme
GCAP	Green City Action Plan

SECAP	Sustainable Energy and Climate Action Plan
PAASC	Climate change mitigation and adaptation plan
EDIH	European Digital Innovation Hub
WB	World Bank
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EEC	European Economic Community
EIB	European Investment Bank
ERDF	European Regional Development Plan
ETS	Emissions Trading System
EU	European Union
EC	European Commission
GHG	Greenhouse gas
PPP	Public-Private Partnership
RES	Renewable energy source
SUMP	Sustainable Urban Mobility Plan

I. COMMITMENTS



FORMAL AMBITION

- The local climate neutrality context, highlighting the strategic directions adopted at the local level.

The context of local climate neutrality in Alba Iulia is centered on implementing a set of strategic directions adopted at the local level, aligned with European and national objectives regarding climate change. The city has set a clear **goal to achieve climate neutrality by 2030 at local level and by 2035 at metropolitan level**, aiming to reduce greenhouse gas emissions by 86% compared to 2021 reference year, ensuring a sustainable and resilient future for the community.

The main strategic directions include:

- Increasing energy efficiency across all sectors by promoting automation technologies, thermal insulation, and building renovations;
- Developing and promoting renewable energy sources, both for domestic use and urban

infrastructure, to reduce dependence on fossil fuels;

- Modernizing transport systems and promoting sustainable modes such as walking, cycling, and public transportation to decrease emissions from mobility;
- Implementing digital solutions and smart technologies for energy management, monitoring, and sustainable urban planning;
- Developing green infrastructure, such as green spaces, urban regeneration zones, and climate adaptation measures like rainwater management and flood risk reduction.

These directions are supported by concrete measures, including modernization of buildings, transportation efficiency, renewable energy promotion, and the creation of partnerships for implementing sustainable projects. Additionally, Alba Iulia aims to utilize data and innovative technologies to monitor progress and adapt actions in real time, transforming the city into an intelligent and environmentally friendly environment/urban area, in accordance with strategic sustainability and urban resilience objectives.

- **The significance and / or opportunities associated with developing this Climate Neutrality Action Plan, particularly in relation to the relevant European strategic priorities.**

The development of the Climate Neutrality Action Plan in Alba Iulia marks an important step toward the European commitment to a sustainable future. Aligned with the European Green Deal and the EU's goal of climate neutrality by 2050, the plan positions the city as an active player in the green transition, in line with strategies such as the Climate Law, the European Climate Pact, and the Fit for 55 package.

This initiative offers opportunities to enhance local resilience and resource efficiency through integrated measures in areas such as energy, mobility, urban planning, and environmental protection. Innovative technologies and digital solutions support sustainable development and contribute to the city's digital transition.

The plan also opens access to key European funding for green investments, infrastructure upgrades, and community engagement. Involving citizens and local stakeholders strengthens social cohesion, the green economy, and quality of life.

With its ambitious goal of reaching climate neutrality by 2030, Alba Iulia sets a strong example, bringing direct benefits such as cleaner air, increased economic and touristic appeal, and a healthier urban environment, until 2035 the city aims to reach climate neutrality in all sectors at metropolitan area.

- **The vision (and / or goal and / or objectives) and targets officially endorsed by the Climate Neutrality Action Plan for achieving climate neutrality, highlighting the planned reductions in CO₂ emissions.**

The Climate Neutrality Action Plan for Alba Iulia articulates a forward-looking and ambitious vision

to position the city as a climate-neutral, sustainable, and resilient urban environment by 2030. This vision is firmly rooted in the broader goals of European and national climate strategies, emphasizing the urgent need to reduce greenhouse gas emissions and foster sustainable development.

The primary objective of the plan is to achieve a minimum of 40% reduction in CO₂ emissions by 2030 compared to 2008 levels (according to SECAP - Covenant of Mayors signatory), significantly advancing the city's climate commitments outlined in European directives such as the EU Climate Law and the National Energy and Climate Plan (PNIEC). This target aligns with the EU's broader aim of cutting greenhouse gases by at least 55% by 2030 as part of the Fit for 55 package, illustrating Alba Iulia's commitment to contributing meaningfully to continental efforts and reaching climate neutrality by 2035 at metropolitan area. The CCC integrated the feedback for the external evaluators and redesigned the baseline year to 2021 for the current policy contract.

Further, the plan articulates specific targets and measures that support this overarching goal, including:

- Enhancing energy efficiency across all sectors — residential, commercial, public buildings, and urban infrastructure — through modernization, automation, and insulation upgrades.
- Increasing the share of renewable energy sources in the city's energy mix, aiming to reduce reliance on fossil fuels and cut associated emissions.
- Promoting sustainable mobility solutions such as expanding public transportation, encouraging walking and cycling, and discouraging private car usage within the city to lower transport-related emissions.
- Integrating smart technologies and digital solutions for real-time monitoring and management of energy consumption and emissions.
- Developing green infrastructure and climate adaptation measures to mitigate the impacts of climate change while supporting emission reduction strategies.

The plan's targets and actions are designed to work synergistically to close the emission gap and support Alba Iulia's vision of a green, resilient, and inclusive city. Achieving these objectives will not only contribute to local environmental and health benefits but also demonstrate Alba Iulia's leadership at the urban level in Europe's climate transition efforts. Through this strategic approach, the city aims to realize a sustainable future characterized by reduced carbon emissions, increased urban wellbeing, and enhanced economic resilience, all in alignment with European climate neutrality commitments.

- **The overall direct impact expected from implementing the interventions outlined in the Action Plan, together with the total estimated budget.**

The implementation of the interventions outlined in Alba Iulia's Climate Neutrality Action Plan is expected to produce significant positive environmental, economic, and social impacts. Key anticipated direct impacts include:

- **Reduction of Greenhouse Gas Emissions:** The plan aims to reduce citywide CO₂ emissions by

at least 85% by 2030 at local level and in 2035 at metropolitan level, contributing substantially to climate change mitigation efforts.

- **Improvement of Air Quality and Public Health:** Through cleaner transportation, green infrastructure, and energy-efficient buildings, the plan will enhance air quality and reduce health-related issues associated with pollution.
- **Increased Energy Savings and Cost Efficiencies:** Upgrades in energy performance and renewable energy use are expected to decrease energy costs for residents and businesses.
- **Enhanced Urban Resilience:** The interventions will improve the city's capacity to withstand climate

impacts like flooding and heatwaves, safeguarding urban infrastructure and communities.

Economic Opportunities: Promoting green technology, sustainable mobility, and environmental innovations will create new jobs and stimulate local economic growth.

Regarding the overall financial aspect, the total estimated budget for implementing the interventions within the Climate Neutrality Action Plan is approximately **€1,000.000,000 euros**. This funding will be channeled through a combination of national sources, European Union funds, and private investments, aimed at supporting the prioritized sectors and measures necessary to achieve the set climate and sustainability objectives. **Own funds 12%, Regional, national, EU funds and financing: 77%, Private financing: 8%, Other 3%.**

In summary, the strategic investments are projected to deliver substantial environmental benefits, elevate the city's climate resilience, stimulate economic development, and improve the quality of life for Alba Iulia's residents, all within a supported financial framework of around €350 million in the first phase - until 2030 and another envelope of €650 millions until 2035.

- **The local administrations should also commit to adhering to high architectural standards for the public projects, particularly for those with significant community or environmental impact.**

According to the strategic guidelines outlined in the development plans, local administrations are strongly encouraged to adhere to high architectural standards for all public projects, especially those with significant community or environmental impact. This commitment aims to ensure that urban development is not only functional and sustainable but also aesthetically coherent and culturally respectful.

High architectural standards for public projects promote several benefits:

- Enhancement of urban aesthetics and the city's identity, contributing to a distinct and attractive urban landscape.
- Integration with cultural heritage, particularly when refurbishing historic buildings or developing new constructions near heritage sites, ensuring preservation of cultural values.



- Environmental sustainability, by incorporating innovative, eco-friendly design principles that minimize ecological footprints.
- Community acceptance and pride, fostering a sense of ownership and positive community engagement with urban interventions.

This approach aligns with the strategic emphasis on quality urban spaces, sustainable architecture, and responsible urban planning, reinforcing Alba Iulia's vision of a resilient, attractive, and livable city committed to excellence in its public infrastructure and development projects.

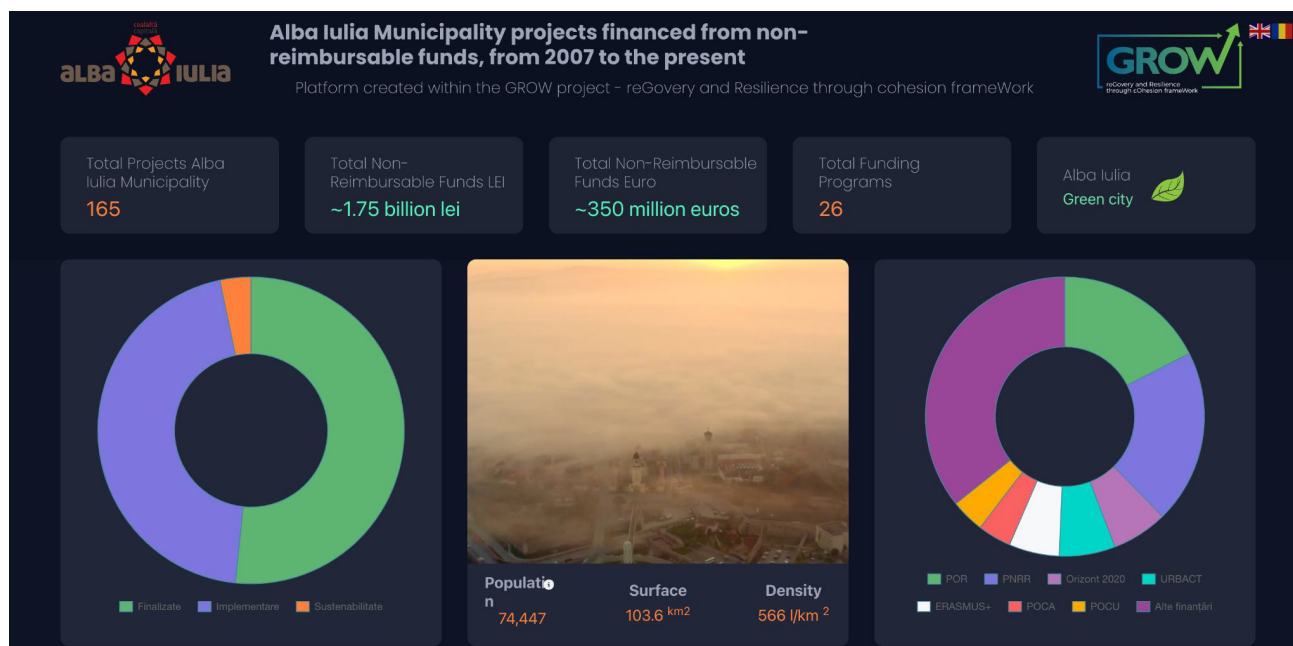


Figure 1 Alba Iulia Municipality projects - www.proiecte.apulum.ro

GUIDING PRINCIPLES

Provide a brief overview (1 page) of the principles that directed the Climate Neutrality Action Plan's design process, as well as those that will guide its implementation and monitoring within the designated time frame.

The Climate Neutrality Action Plan for Alba Iulia is based on core principles ensuring a sustainable, inclusive, and effective path to climate neutrality by 2030 and 2035 at metropolitan area.

Principles Guiding the Design Process of the Climate Neutrality Action Plan

- 1. Participatory and Inclusive Approach:** The development of the CNAP was rooted in extensive stakeholder engagement, involving the Quadruple Helix: local authorities, citizens, civil society, local universities, private sector, and technical experts. This inclusive process ensured that diverse perspectives and local needs were incorporated, fostering a sense of ownership and social acceptance for the plan's initiatives - as part of designing the Alba Iulia GCAP (Alba Iulia Green City Action Plan financed by EBRD).
- 2. Alignment with European and National Policies:** The plan was designed to comply with European commitments such as the Covenant of Mayors for Climate and Energy, Signatories of the Green Cities Accord at EU level, national/regional/county level/local strategies addressing climate adaptation and energy transition. This alignment ensures coherence and access to EU funding and support mechanisms.
- 3. Holistic and Systems-Based Approach:** The plan adopts an integrated perspective, considering interrelated sectors such as energy, transport, waste, green infrastructure, and social development. This systemic approach promotes synergistic actions that accelerate

progress toward climate neutrality.

4. **Sustainability and Circular Economy Principles:** The design emphasizes sustainable resource use, waste minimization, renewable energy integration, and eco-friendly infrastructure development, aligning actions with principles of circular economy and long-term resilience.
5. **Data-Driven and Evidence-Based Planning:** The process involved comprehensive data collection, baseline assessments, and modeling to set realistic, measurable targets. Monitoring frameworks are embedded to evaluate progress and guide adaptive management.
6. **Future-Oriented Flexibility:** Recognizing the dynamic nature of technological and policy landscapes, the plan incorporates flexibility to adjust strategies in response to new innovations, evolving climate conditions, and stakeholder feedback.

Principles Guiding Implementation and Monitoring

1. **Transparency and Accountability:** Regular reporting—aligned with EU requirements—will ensure transparency, allowing stakeholders and citizens to track progress, understand challenges, and contribute to decision-making.
2. **Partnership and Collaboration:** The plan promotes strong cooperation among public authorities, private sector entities, research institutions, and civil society to foster innovative solutions and mobilize resources effectively.
3. **Long-Term Resilience and Adaptability:** While focusing on ambitious emission reduction targets, the plan also emphasizes climate adaptation, strengthening the city's resilience to climate impacts through integrated strategies and continuous capacity building.
4. **Innovation and Technology Utilization:** The implementation will leverage cutting-edge technologies such as smart grids, IoT, and renewable energy solutions, promoting efficient resource use and urban sustainability.
5. **Continuous Monitoring and Evaluation:** The plan prescribes bi-annual and four-yearly reporting cycles to evaluate performance based on key impact indicators. These assessments will inform necessary adjustments, ensuring that objectives remain achievable within the set timeframe.



Figure 2 Community Barometer - barometrucomunitar.apulum.ro

SIGNATORIES

In the below table, list the signatories of the Climate Neutrality Action Plan. Include local, regional, and potentially national and international stakeholders which have the interest and / or capacity to accelerate the implementation of this Action Plan and who can significantly influence the achievement of climate neutrality at the local level.

We, the undersigned, pledge to actively support Alba Iulia's climate neutrality goals by 2035, as outlined in its Climate Neutrality Action Plan. We commit to collaborative efforts aimed at substantial greenhouse gas emission reductions and fostering systemic change, in line with the objectives set forth in this document.

Table 1 Community support

INSTITUTION	SECTOR	REPRESENTATIVE	POSITION	SIGNATURE	SIGNATURE DATE
Institute for Research in Circular Economy 'Ernest Lupan'	NGO, Circular Economy	S.L	Executive Director		
Association of Pensioners Hope of Alba	NGO Social	M.G.	Legal representative		
Start Career Association	NGO Social	M.F.	Legal representative		
PAEM Alba Foundation	NGO Sustainable development	D.B.	Contact person		
I am Association	NGO Social	A.G.	Legal representative		
Romanian Green Building Council (RoGBC)	NGO Energy and sustainable development	I.A.B.	Legal representative		
We Secure the Future of Education Association / Cetate 21 Alba Iulia Owners' Association	NGO Youth, education, civic engagement	S.C.T.	Legal representative		
OER Association	NGO Energy and sustainable development	I.T.	Legal representative		
Center for Personal Development and Prevention of Risk Behaviors Association	NGO Social	M.I.P.	Legal representative		
Knights for Education Alba Iulia Association	NGO Social, education	A.O.	Legal representative		
Society of Energy Auditors and Managers of Romania (SAMER)	NGO Energy and sustainable development	A.C.	President		
ANCIR EXPERT SRL	Company	R.R.	Legal representative		
Colibri Tour SRL	Company	V.R.	Legal representative		

Fleschin Consult SRL	Company	S.F.	Legal representative		
Logischool Alba Iulia	Company	A.M.G.	Legal representative		
Alba Travel & Events	Company	D.Z.	Legal representative		
Entertainment & Creative Events SRL	Company	V.S.B.	Legal representative		
Chamber of Commerce and Industry Alba	Public institution, Economy	A.O.	Head of legal department		
National Museum of the Union Alba Iulia	Public institution, Culture, heritage	G.T.R.	General Manager		
Prefecture of Alba County	Public institution, public authorities	N.A.	Prefect		
UAT Stremț - AIDA TL	Public institution, public authorities	T.P.	Mayor		
UAT Cricău - AIDA TL	Public institution, public authorities	A.F.T.	Mayor		
Citizens of Alba Iulia	Local community	T.A., C.F.A., D.I.V., S.M.D., S.N.T., S.D., D.M.N., D.A.M., M.G., A.R., B.R., M.B.	Civil society		
Local Energy Agency - ALEA Alba	Local energy agency	F.A.	Legal representative		
Technical University of Cluj Napoca – Alba Branch	Technical University of Cluj Napoca – Alba Branch	C.F.	Legal representative		
AMPEER	National association of small green energy producers	D.I.	Cofounder		

The support of the local stakeholders was possible in the framework of a good collaboration in different working groups, but also the communication of the M100 initiative through online platforms. The feedback from the community was positive and the document was co-created with the support / feedback of different stakeholders at local level. The involvement was ensured also during the application process to become a M100 city at national level.



Also, the local stakeholders will be actively involved in the implementation phase, in this respect the team of Alba Iulia ensured an informal framework for continuous and systematic stakeholder involvement throughout implementation. The collaboration framework after receiving the M100 label, will be ensured through:

Periodic working groups (in a face-to-face format but also online) - minimum one meeting each 6 months of implementation, ensuring the permanent participation of a core team from the local community stakeholders.

Nomination of a core team responsible for monitoring and reporting the progress. Online tools such as Zoom, Google Drive, Microsoft Teams, Slido, Miro Board will also be employed regularly in order to ease communication, to obtain fast and relevant feedback from the signatories with regard to the different stages of the plan.

II. ACTION PLAN



INTRODUCTION

Briefly describe (1-2 pages) the local context within which the Action Plan is being formulated and outline the general gap it aims to address, by taking into account relevant local strategies and policies, socio-economic development factors, environmental conditions and climate considerations etc.

The city of Alba Iulia is in a phase of dynamic urban and socio-economic development, marked by continuous efforts towards modernization and adaptation to new environmental and energy challenges. In recent years, the city has established clear strategic objectives aimed at enhancing



residents' quality of life, promoting sustainability, and attracting investments. These directions are aligned with local, regional, and national policies and strategies supporting the transition toward a cleaner environment, energy efficiency, and environmental responsibility.

The socio-economic context is characterized by a stable population, with aging trends, and an economy primarily based on the service sector, light industry, and agriculture. At the same time, the city boasts significant cultural and historical heritage, which needs to be preserved and valorized in the modernization process. Accordingly, there is particular attention to creating sustainable urban centers that are attractive for residents and tourists alike, and promoting a healthy and ecologically responsible lifestyle.

Environmentally, Alba Iulia faces challenges related to air quality, waste management, and the energy efficiency of public and private buildings. Pollution, especially from transport and industry, affects the health of the population and contributes to greenhouse gas emissions. Moreover, floods and extreme weather events are becoming more frequent, impacting infrastructure and local economic activities.

The energy transition is a fundamental element in this transformation, as the city still heavily relies on conventional energy sources, with untapped potential for renewable sources such as solar and wind energy. Additionally, energy consumption in public and residential buildings must be reduced to achieve sustainability goals and decrease environmental impact.

The City Climate Contract action plan is developed within this complex context, emphasizing the need to align local strategies with national and European directions. An integrated approach is necessary— combining measures to improve energy efficiency, expand renewable energy use, adapt to climate change, and promote sustainable lifestyles. This effort also aims to strengthen administrative capacities and foster a culture of responsibility regarding energy and environment among authorities and citizens alike.

A key aspect in the formulation of the Action Plan is the identification of existing gaps in risk management and the implementation of measures to reduce climate and energy impacts. There is a recognized need to improve monitoring and control tools, establish clear objectives and responsibilities, and increase community awareness and participation. Moreover, infrastructure modernization, including green infrastructure, is vital to combating climate effects and promoting a sustainable urban model.

In conclusion, the Action Plan aims to transform Alba Iulia into an intelligent and sustainable city capable of efficiently responding to environmental, economic, and social challenges. Addressing these issues within a coherent strategic framework seeks to enhance sustainable development opportunities, improve quality of life, and contribute to global efforts in combating climate change.

WORK PROCESS

Within the overarching context of the city's journey toward climate neutrality, outline the working steps involved in preparing the Action Plan, including both the completed stages and the future anticipated ones.

- **Additionally, delineate the timeline and key milestones (including the ones regarding the quality assurance - e.g., foreseen design competitions) for the forthcoming iterations in the Action Plan's development.**

In the context of Alba Iulia's ambitious goal of becoming climate-neutral by 2035 together with the metropolitan area, the process of developing and updating the Sustainable Energy and Climate Action Plan (SECAP) represented a relevant step towards developing the current action plan for the M100 mission followed a series of strategic and technical steps. This pathway includes both completed stages and future planned actions, aimed at ensuring a coherent, transparent, and dynamically adaptable planning process. Additionally, establishing a timeline with key milestones and quality assurance measures—such as innovative design competitions—are essential components to achieve the city's environmental, energy, and resilience objectives.

Working Steps in Preparing the Action Plan

Completed Stages:

Situational Analysis and Data Collection:

- Assessment of current energy infrastructure, consumption patterns, and renewable energy potential (solar, wind, biomass)
- Analysis of current local policies already developed by the city (GCAP, PEE, SECAP, Green City Accord reporting, CDP, Climate adaptation and mitigation plan, SUDS, SUMP etc).
- Evaluation of existing municipal projects and initiatives aimed at improving energy efficiency and renewable deployment.
- Compilation of specific technical data on local renewable sources and energy usage.

Definition of Strategic Objectives:

- Establishment of local objectives for energy efficiency, renewable energy deployment, and climate adaptation.

Development of Policy and Action Frameworks:

- Alignment with European and national climate strategies, and also to the EC Mission including targets such as reaching climate neutrality by 2030.
- Implementation of strategic documents and related regulations.
- Inclusion of measures for energy conservation in heritage and residential buildings, supporting smart grid integration, and renewable projects.

Implementation of Pilot and Ongoing Projects:

- The Smart City Pilot project developed in 2018 by Alba Iulia - becoming a testbed for more than 100 smart city solutions at national level, with the entire financial and technical support and solutions coming exclusively from the private sector. Alba Iulia Smart City 2018 pilot project which aimed to transform Alba Iulia Municipality into the first smart city in Romania: smart lightning systems, smart parking, smart mobility, e-governance, smart administration, 5G networks, smart energy consumption, smart businesses, health, smart education, LoRaWAN technology and innovation labs - was implemented by the Municipality of Alba Iulia, in partnership with the Romanian Ministry of Communications.
-is unique in Romania due to the fact that the private companies who proposed smart city solutions were responsible for covering the costs of testing and implementing the solutions, more than 100 smart city solutions were tested.
- Alba Iulia included in Siemens smart city study beside Bruxelles, Istanbul, Aberdeen and

London. https://www.apulum.ro/images/uploads/fisiere/ALBA_Complete.pdf

Partnership with The Ministry of Communication approved in the Local Council:

<https://se.apulum.ro/Registratura/DetaliuHCL?nr=195&an=2016>

- Deployment of photovoltaic systems in municipal and public buildings.

999 kWp installed capacity

Reduction of primary energy consumption by 1,222,707 MWh/year (34.66%);

Reduction of greenhouse gas emissions from the institutions and public lighting systems by 403.49 t CO₂(34.66%);

This is the second PV system added to the one installed in 2011(one of the first Romanian PV system at city scale) and both of them designed to supply the own consumption. Thus, Alba Iulia grew from covering an estimated of 14% electricity use from RES to more than 49% and other PV systems are planned to be added.

Official video of the project: <https://vimeo.com/940710954/8952558834?share=copy>

- **Ongoing projects with a total value of more than 150,000,000 euros**, 80% of them with a direct impact on climate neutrality and resilience. www.proiecte.apulum.ro
- Initiatives for promoting energy efficiency improvements, and smart city solutions.

Monitoring and Reporting Systems:

- Design and implementation of a monitoring system for air quality and energy consumption, aligned with EU reporting standards (e.g., CO₂ emissions tracking).

Future Anticipated Steps:

1. **Design and Conduct Public Consultations and Stakeholder Engagement:** Engage local communities, industry, and other stakeholders for feedback and co-creation of future actions.
3. **Refine and Update the Action Plan:** Incorporate new data, project results, and stakeholder feedback to update strategic measures and finalize detailed technical and investment plans for upcoming years, particularly emphasizing milestones till 2030.
4. **Define Clear Milestones and Timelines:** Set key milestones, including deadlines for project launches, completion of specific renewable installations, and policy enactments.
5. **Implement New Projects and Initiatives:** Roll out prioritized projects aligned with updated targets and milestones (renewable energy, smart grids, mobility improvements).
6. **Establish Quality Assurance and Evaluation Mechanisms:** Conduct design competitions, peer reviews, and performance evaluations and formalize milestones for assessing progress against legal, environmental, and economic indicators.

Table 2 Timeline and Key Milestones

Timeline	Milestone/Activity	Description
2024 Q1–Q2	Stakeholder engagement and public consultations	Gathering feedback to refine future actions
2024 Q3	Launch of design competitions for key projects	Ensuring innovative, high-quality project proposals
2024–2025	Incorporation of feedback, refinement of the Action Plan	Updating measures based on new data and stakeholder input
2025	Adoption of updated Action Plan by municipal authorities	Official approval and dissemination
2025–2027	Implementation of low-hanging projects (solar installations, efficiency measures)	Achieving early milestones
2028	Mid-term review, assessment of progress against targets	Formal evaluation and adjustment of strategies
2029	Preparation for the final iteration before 2030 targets	Final adjustments and scaling of successful projects

2030	Achievement of formal climate neutrality targets and comprehensive evaluation at local level	Completion of implementation phase, reporting at local level
2035	Achievement of formal climate neutrality targets and comprehensive evaluation at metropolitan level	Completion of implementation phase, reporting at metropolitan level

Quality Assurance and Design Competitions:

- These are foreseen as crucial measures to guarantee the high quality of technological solutions, following initial policy and technical assessments.
- The competitions will serve to attract innovative ideas, stimulate stakeholder participation, and set technical standards, thus ensuring the credibility and effectiveness of the projects.

Summary: The city's journey toward climate neutrality involves a phased approach starting from data assessment and strategic planning, progressing through stakeholder engagement, innovative design competitions, project implementation, and continuous evaluation. The immediate future focuses on refining strategic measures and launching high-quality projects, with key milestones aligned to 2024–2030, culminating in the achievement of climate neutrality goals by 2030/2035.

GREENHOUSE GAS EMISSIONS BASELINE INVENTORY

Describe and elaborate on the most recent greenhouse gas (GHG) inventory conducted by the city, in order to establish the baseline emissions and also to identify the emissions gap towards achieving climate neutrality by 2035.

- Make sure to also assess the greenhouse gas (GHG) baseline inventory - you can refer to: the sources of data collection and their rationale, the baseline emission conversion factors used, proposed measures for improving future data collection processes etc.

The most recent greenhouse gas (GHG) inventory conducted by the City of Alba Iulia has been primarily based on data collected from municipal sources and sectoral analyses, as evidenced in various strategic and planning documents. The key inventory describes the 2021 baseline emissions, which are integral in establishing the baseline for future reduction targets and measuring progress towards climate neutrality by 2035. The inventory is available as part of being Signatory of the Covenant of Mayors- reporting constantly the evolution to the European Commission with the expertise of ALEA and Servelect - the Energy managers of the city.

Data Collection and Sources

The inventory consolidates energy consumption and corresponding GHG emissions across the main sectors within the city boundary. Also, Alba Iulia benefits of the ANERGO observatory at county level-a tool developed and monitored by ALEA ([link](#)). The data collection leverages the municipal database provided by ANERGO, the regional energy observatory, which supplies aggregated data for municipal buildings, tertiary sector facilities, residential buildings, public lighting, and transport (municipal, public, and private sectors). Importantly, individual consumption data from residential and industrial sectors are not available; instead, the inventory relies on aggregated sectoral data. This is justified by the difficulty in obtaining detailed sector-specific data, particularly for private residential and industrial sectors, which are critical sources of emissions.

Also Alba Iulia is considered **Sustainable community** - received the European Energy Award - Swiss Embassy - The first city in Transylvania to be awarded with maximum score in August 2021.

European Energy Award initiative

Represents yet another integrated with the others, and especially with the CoM, voluntary engagement of the Municipality to achieve sustainable development, within the energy transition towards carbon neutrality.

The EEA system, adopted by the Swiss government and promoted all across the EU is proving effective tools to monitor the progress on the following: energy, buildings, transportation, waste management, governance.

Emissions Scope and Methodology

The inventory explicitly excludes emissions from energy generation, such as centralized electricity and heat production, due to the lack of local energy production in Alba Iulia. It instead employs the IPCC standard emission factors to convert energy consumption into GHGs. The calculation encompasses Scope 1 emissions from direct sources (buildings, transport, waste) and Scope 2 indirect emissions related to electricity and heat consumption, although the latter are minimized due to the city's energy profile.

Quantitative Results

The 2021 baseline emissions total approximately **208,576 tonnes CO₂**, as per the inventory report as follows:

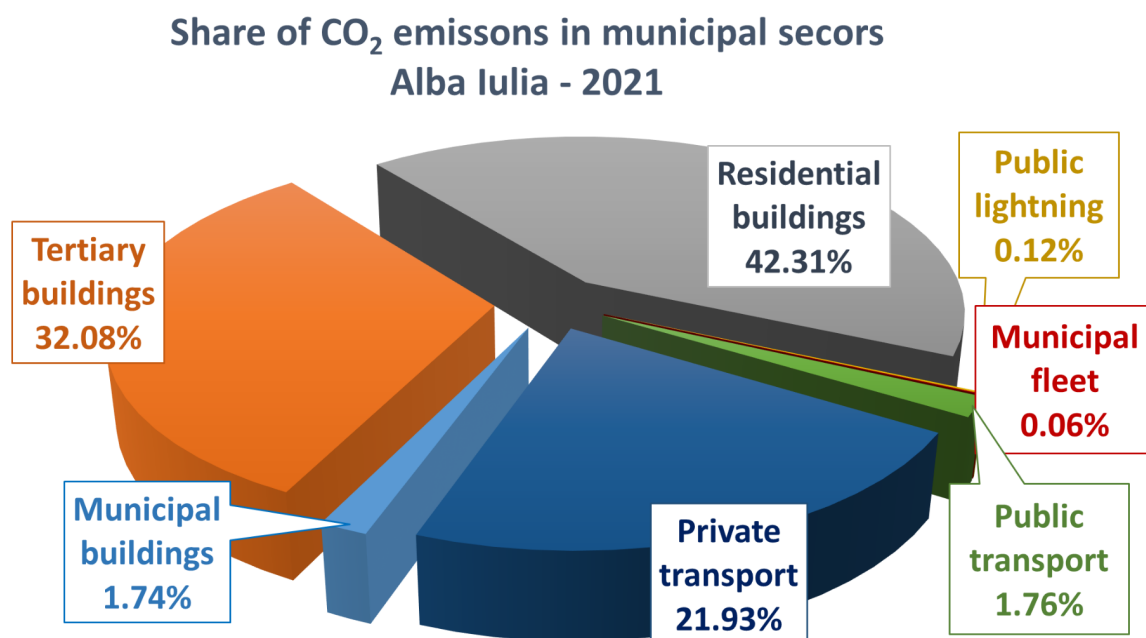


Figure 3 Share of CO₂ emissions in municipal sectors from Alba Iulia

Data source: PIEE 2022 Alba Iulia

Share of CO₂ emissions in municipal sectors
Alba Iulia - 2021

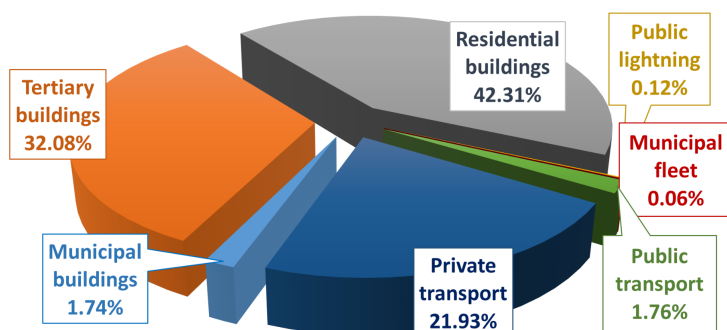


Figure 3 CO₂ emission in municipal sectors from Alba Iulia

Municipal CO₂ emissions by energy carrier
Alba Iulia - 2021 [tCO₂/yr]

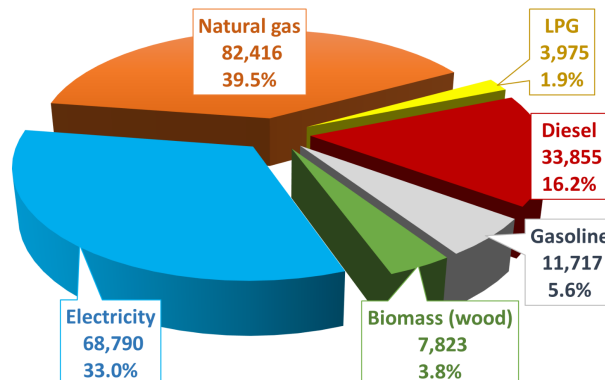


Figure 4 CO₂ emission by energy carrier in Alba Iulia

Data source: PIEE 2022 Alba Iulia

Table 3 CO₂ emission by energy carrier for Alba Iulia (PIEE 2022)

Municipal sector	Estimated CO ₂ emissions 2021 (tCO ₂ /yr)
Municipal buildings	3,623 (1.7%)
Tertiary buildings	66,904 (32.1%)
Residential buildings	88,243 (42.3%)
Public lighting	259 (0.1%)
Municipal fleet	121 (0.1%)
Public transport	3,677 (1.8%)
Private transport	45,749 (21.9%)
Total	208,576 (100%)
Data source: PIEE 2022 Alba Iulia. Industry sector is not included.	

Rationale for Data Sources and Use

The reliance on aggregated municipal data is justified given the city's energy infrastructure and the operational capacity for data collection. The inventory's use of standard emission factors and established methodologies from the IPCC (JRC) ensures comparability and scientific validity. Moreover, the inventory serves as a foundation for monitoring progress against targets set within Alba Iulia's sustainable urban development strategies.

Measures and Improvement of Data Collection Processes

The city plans to enhance future inventories by:

- Improving data granularity, possibly through pilot projects collecting sector-specific and building-level data
- extending the current observatory to the entire Metropolitan area.
- Expanding cooperation with private sector stakeholders to access more detailed consumption data.
- Incorporating real-time energy monitoring systems to facilitate ongoing data collection.
- Updating inventory methodologies to include new sectors and sources, aligning with evolving standards and best practices.

Emissions Gap and Climate Neutrality Target

The baseline GHG inventory from 2021 indicates that ongoing and future efforts are necessary to meet the city's ambitious climate neutrality goal by 2035, especially considering sectoral emissions produced in the top 3 local CO₂ emissions sources: residential (42%), tertiary (32%), and transport (22%) sectors. Continued data collection, reinforced policies, and targeted measures—such as promoting energy efficiency and renewable energy—will be critical in closing the emissions gap towards achieving net-zero emissions.

In Summary:

Alba Iulia's 2021 GHG inventory is anchored on aggregated municipal energy consumption data, using IPCC standard emission factors, which provides a credible baseline for measuring progress. The inventory emphasizes the need for improved data granularity, expanded coverage, and systematic monitoring to bridge the emissions gap necessary for reaching climate neutrality by 2035. The ongoing development of data collection methodologies and targeted measures will be key to fulfilling the city's climate commitments. **However at metropolitan level there is no data available so far therefore the first project implemented under the M100 will be extending data collection at metropolitan level - updating the SECAP at metropolitan level.**

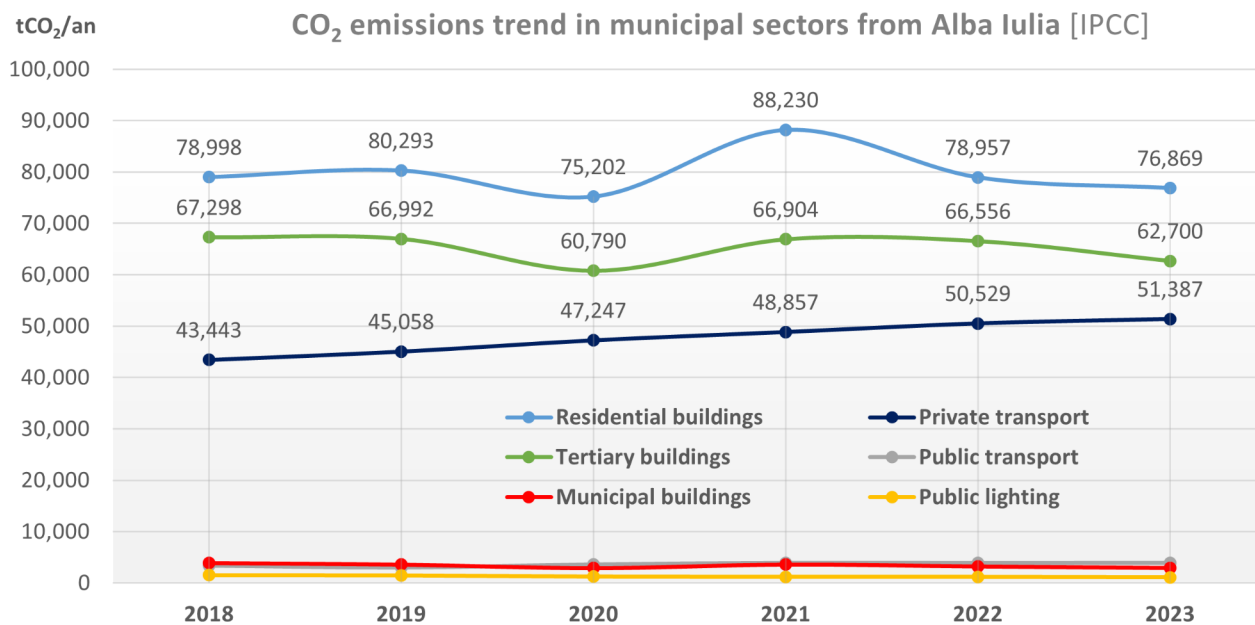


Figure 6 CO₂ emissions trend in municipal sectors from Alba Iulia

Source: ANERGO Energy Observatory - Local emissions monitoring system (ALEA)

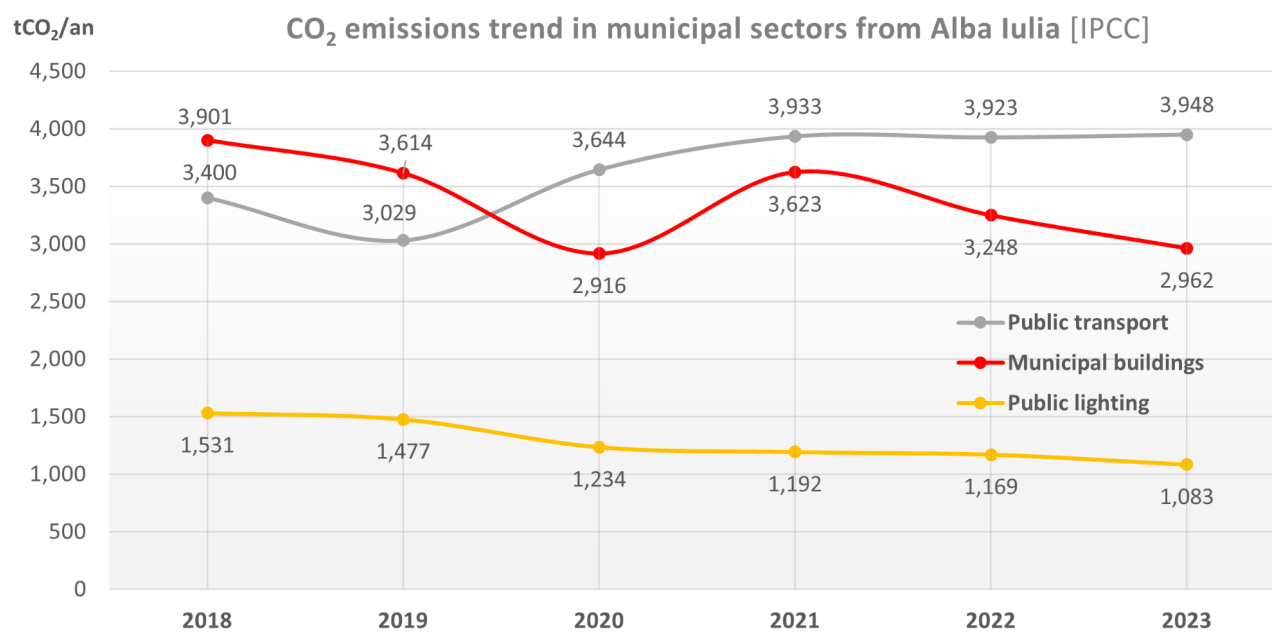


Figure 7 CO₂ emissions trend in municipal sectors from Alba Iulia

Source: ANERGO Energy Observatory - Local emissions monitoring system (ALEA)

FINAL ENERGY USE BY SOURCE SECTORS

Share of energy consumption in municipal sectors
Alba Iulia - 2021

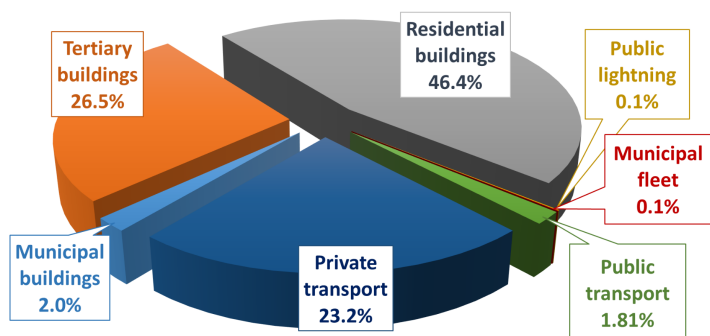


Figure 9 Final energy use in municipal sectors from Alba Iulia

Municipal energy consumption by energy carrier
Alba Iulia - 2021 [MWh/yr]

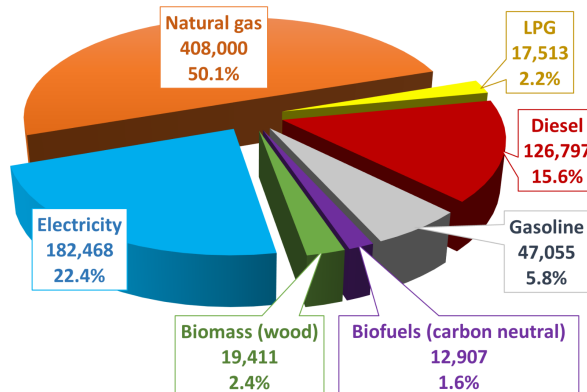


Figure 8 Final energy use by energy carrier for Alba Iulia

Data source: Energy Efficiency Improvement Programme (PIEE) of Alba Iulia (2022 update)

→ Indicate the base year: 2021

→ Indicate the used unit: MWh/year

Table 4 Energy use by source estimated by scope

	SCOPE 1	SCOPE 2	SCOPE 3	TOTAL
BUILDINGS				
FUEL TYPE / ENERGY USED ¹	Electricity - Not quantified Natural Gas (primarily heating) - 408,000 Biomass (wood, pellets, etc.) - 19,411 Fuel for own transport (municipal) - 491	Electricity - 182,468 Natural Gas (primarily heating) - 0 Biomass (wood, pellets, etc.) - 0 Fuel for own transport (municipal) - 0	Electricity - 0 Natural Gas (primarily heating) - 0 Biomass (wood, pellets, etc.) - 0 Fuel for own transport (municipal) - 0	Electricity - 182,468 Natural Gas (primarily heating) - 408,000 Biomass (wood, pellets, etc.) - 19,411 Fuel for own transport (municipal) - 491
TRANSPORT				

¹ Electricity and natural gas used in municipal and residential buildings are accounted under Scope 2 (indirect emissions). Biomass usage is noted mainly in residential heating but lacks precise quantification; potential indirect emissions (Scope 3) might be considered depending on data inclusion.

Fuel consumption for municipal vehicles could be Scope 1 if included

FUEL TYPE / ENERGY USED ²	<i>Diesel - 126,399</i> <i>Gasoline - 46,995</i> <i>LPG - 17,513</i> <i>Electricity (for e-mobility) - Not quantified</i>	<i>Diesel - 0</i> <i>Gasoline - 0</i> <i>Electricity (for e-mobility) - Not quantified</i>	<i>Diesel - 0</i> <i>Gasoline - 0</i> <i>Electricity (for e-mobility) - Not quantified</i>	<i>Diesel - 126,399</i> <i>Gasoline - 46,995</i> <i>LPG - 17,513</i> <i>Electricity (for e-mobility) - Not quantified</i>
WASTE				
FUEL TYPE / ENERGY USED	<i>Biogas from wastewater treatment - Planned projects</i>	<i>Biogas from wastewater treatment - 0</i>	<i>Biogas from wastewater treatment - 0</i>	<i>Biogas from wastewater treatment - Planned</i>
INDUSTRIAL PROCESS AND PRODUCT USE (IPPU)				
FUEL TYPE / ENERGY USED ³	<i>Natural Gas, Electricity, Other fuels - Not quantified</i>	-	-	<i>Natural Gas, Electricity, Other fuels - Not quantified</i>
AGRICULTURAL, FORESTRY, AND LAND USE (AFOLU)				
FUEL TYPE / ENERGY USED	<i>Biomass (fuelwood, pellets) - Not quantified</i>	<i>Biomass (fuelwood, pellets) - Not quantified</i>	<i>Biomass (fuelwood, pellets) - Not quantified</i>	Not quantified

² *Transport sector* is a major consumer of fossil fuels (approximately 25% of total energy use), primarily diesel and gasoline for private and public vehicles,,.

Scope 1 includes direct fuel consumption of municipal and private transport.

Efforts are underway to increase electric mobility, which will shift some energy consumption to Scope 2 electricity

³ Industrial and commercial consumption is included broadly in non-municipal non-residential energy use; specific data for IPPU is limited or aggregated with commercial sectors in municipal data

EMISSION FACTOR APPLIED

→ Indicate the primary energy type and greenhouse gas (GHG) emission factor in accordance with the methodology used:

The main types of energy and greenhouse gas (GHG) emission factors for Alba Iulia are as follows:

1. Main energy types used in the building and residential sectors:

- **Natural gas:**
 - It is the primary fuel used for heating in the residential, municipal and tertiary sector
 - Represents 50.1% of the total energy consumption in buildings
- **Electricity:**
 - Used in buildings for lighting, equipment, climate control systems, cooking etc.
 - Its share in total energy consumption is about 22.4%, with expected increases in the tertiary sector
- **Biomass (wood, pellets):**
 - Used by about 10% of individual households from residential sector, fire wood is mainly used for heating, though in smaller volumes of only 2.3% from total municipal energy consumption
- **Fossil fuels (diesel, gasoline):**
 - Used in transportation and some backup equipment, they represents 21% of energy consumed in the municipality (not including biofuel fraction of 1.,5%)

2. GHG emission factors according to the methodology:

- **Methodology:**
 - GHG emissions are estimated by multiplying energy consumption by specific conversion factors based on **IPCC** guidelines (JRC, 2022) and the methodology of **Covenant of Mayors for Climate and Energy** regarding elaboration of baseline and monitoring emissions inventories at local level detailed in the Guidebook on 'How to develop a Sustainable Energy and Climate Action Plan - SECAP (JRC, 2018). **Industry sector was not included**, as most strategic documents implemented by the municipality - such as this one - will not cover investments or deploy any specific interventions in industry sector that is already regulated by national legislation and emission standards.
 - Due to limited data availability, emissions from the **waste sector** were estimated at 5% of the total emissions from the building and transport sectors. These emissions were provisionally classified under Scope 1, representing the equivalent emissions associated with waste transportation. This estimate will be refined and updated as more detailed data becomes available in future monitoring phases of the document.

- IPCC CO₂ emission factors are standardized and applicable for each energy type to ensure reliable and comparable estimates

Also, for the data collection, emission inventory, and monitoring framework of the progress in emissions reduction per sector, **the M100 methodologies were used, mainly:**

- **Net-zero monitoring indicators for climate neutrality interventions** - (for the required indicators but also some of the recommended ones)
- **Guidelines for participatory approaches on climate neutrality - proposing tools for engaging stakeholders** such as: participatory budgeting, surveys (using the city's own platform for the community barometer), co-creation workshops/events for co-planning, co-implementation and co-monitoring.
- **Participatory process for monitoring the transition to climate neutrality guidelines**, proposing methods such as: establishing the reporting period to a frequency of 2 years, to report the status of the monitoring, evaluation and learning indicators. Also for the reporting the GHG emission indicators bi-annually as well for the revision of the Action plan.
- **Methodology for data collection, processing, visualisation, interpretation and dissemination** , to define and establish the necessary data based on the selected indicators, calculation methods or formulas and units of measurement.
- **The Document to estimate Sources for estimating GHG Emissions,**
- **CURB: Climate Action for Urban Sustainability** (WB) mainly for the areas that are currently not covered / or less covered by data base indicators (such as waste, water)

- **Emission factors for the main energy sources:**

- **Natural gas:** Average emissions estimated at **0.202 kg CO₂/kWh** used for heating in buildings and other municipal facilities (JRC 2022, IPCC)
- **Electricity:** Electricity-sourced emissions will vary each year depending on the primary energy providers connected to the electricity distribution grid. JRC 2024 IPCC country-specific GHG emission factors for electricity consumption for Romania for year 2021 was used: **0.377 kg CO₂/kWh**
- **Biomass:** Fire wood is used in the municipality for partially heating some individual houses. The main heating source is natural gas. As the wood sold in Alba Iulia for heating purposes is **not carbon neutral** certified, the **ncn** IPCC emissions factor for other biomass/wood was used: **0.403 kg CO₂/kWh**

3. Summary:

Table 5 Emission by energy type

Energy Type	Main Use	GHG Emission Factor (kg CO ₂ /kWh)	Methodology
Natural gas	Heating, hot water	0.202	IPCC (JRC, 2022)
Electricity	Buildings, equipment & facilities	0.377	IPCC (JRC, 2024) electricity emissions factor for Romania, year 2021
Biomass	Heating (some individual houses)	0.403	IPCC (JRC, 2022) ncn - not carbon neutral
Fossil fuels	Transport, backup systems	0.267 - diesel 0.249 - gasoline 0.227 - LPG	IPCC (JRC, 2022)

Conclusion:

In Alba Iulia's energy portfolio, **natural gas** is the main energy source for the residential and building sectors, with an emission factor of **0.202 kg CO₂/kWh**, based on IPCC methodology. Electricity also has a significant environmental impact due to its share in the total municipal energy consumption and its associated emission factor of **0.377 kg CO₂/kWh** in 2021.

→ **Indicate the used method, e.g., GPC, IPCC, CRF, national etc.:**

The primary methods indicated for estimating energy consumption and greenhouse gas (GHG) emissions are as follows:

1. IPCC Methodology (Intergovernmental Panel on Climate Change): Many references, especially in documents like, specify that emissions factors are based on the IPCC guidelines (e.g., JRC 2022), which provide internationally recognized methods for calculating GHG emissions from various sectors and sources.
2. CRF (Common Reporting Format): Some data collection and reporting adhere to the European Union's CRF reporting standards, which are aligned with IPCC methodologies, especially in the context of national inventories.
3. National Guidelines and Standards: Several documents, including,, and, mention the use of national standards and data, such as those provided by the Romanian authorities and agencies like ANRE - National Energy Regulatory Authority for national CO₂ electricity factor.

4. GPC (Global Protocol for Community-Scale Greenhouse Gas Emission Inventories): While not explicitly referenced in the documents, some methodologies align with GPC principles, especially in the comprehensive approach to sectoral accounting and community-level inventories, but it is not the primary method indicated.

Table 6 Summary of the used methods

Method	Primary Context in Documents
IPCC	Main method for GHG emission factors and calculation guidelines across reports. Most references explicitly specify IPCC (JRC 2022).
CRF	Used in environmental reporting standards, especially for inventories in accordance with EU regulations.
National	Emission factors and other data sourced from Romanian national standards and regulatory agencies (e.g., ANRE - National Energy Regulatory Authority for national CO ₂ electricity factor).
GPC	Not explicitly mentioned; generally aligned but not directly referenced.
M100 methodology	Emission inventory, and monitoring framework of the progress in emissions reduction per sector
CURB	CURB: Climate Action for Urban Sustainability (WB)

Conclusion:

The main method used in the documents from the M100 folder for calculating emissions is the IPCC methodology, supplemented by national standards and CRF reporting practices for inventory consistency.

Table 7 Emission factor

PRIMARY ENERGY/ ENERGY SOURCE	CARBON DIOXIDE (CO ₂)	METHANE (CH ₄)	NITROUS OXIDE (N ₂ O)	F-GASES (HYDROFLUOROCARBONS AND PERFLUOROCARBONS)	SULPHUR HEXAFLUORIDE (SF ₆)	NITROGEN TRIFLUORIDE (NF ₃)
ELECTRIC ENERGY	Significant indirect CO ₂ emissions due to electricity production mainly from fossil fuel-based power plants with low efficiency; accounts for ~33% of total CO ₂ emissions despite only ~22.4% share in final energy consumption	Negligible direct CH ₄ emissions; may have indirect associated emissions	Negligible	Negligible	Negligible	Negligible
NATURAL GAS	Largest contributor to CO ₂ emissions ~39.5% - related to buildings heating, hot water consumption and cooking, with a ~50,1% final energy consumption share at municipal level	Possible minor fugitive emissions in supply chain	Minor emissions possible	Negligible	Negligible	Negligible
DIESEL	Significant CO ₂ emissions from transport sector with ~33.855 tonnes/ye	Low CH ₄ emissions	The most significant source of local N ₂ O emissions, expected to decrease as	Negligible	Negligible	Negligible

	ar (~16.2% share)					
			transport fleets are renewed			
GASOLINE	Significant CO ₂ emissions from transport ~11,717 tonnes/year (5.6% share)	Low CH ₄ emissions	The second most significant source of local N ₂ O emissions, expected to decrease as transport fleets are renewed	Negligible	Negligible	Negligible
GPL	LGP amounts to ~3,975 tonnes/year (1.9% share)	-	-	-	-	
BIOFUEL	Carbon-neutral biofuels are evaluated at 1.6% of total municipal energy consumption	Possible CH ₄ emissions during production and combustion	Possible N ₂ O emissions	Negligible	Negligible	Negligible
RENEWABLE ENERGY	PV green energy production systems are being used on multiple municipal buildings/facilities	Minimal to none	Minimal to none	Minimal to none	Minimal to none	Minimal to none

Key Observations:

- **Carbon Dioxide (CO₂) Emissions** dominate greenhouse gas impacts from fossil fuel use in buildings (natural gas) and transport (diesel, gasoline). Electrical energy consumption contributes indirect CO₂ emissions mainly due to energy production at inefficient fossil fuel power plants,.

- **Methane (CH₄) and Nitrous Oxide (N₂O)** emissions are relatively minor but present mainly as fugitive emissions from fossil fuel extraction, biofuel combustion, or certain transport fuels. No detailed quantification was available.
- **Fluorinated gases (F-Gases), Sulphur Hexafluoride (SF₆), and Nitrogen Trifluoride (NF₃)** are not specifically reported or quantified and are likely negligible for the locality based on data availability and typical urban emissions profiles.
- The municipality is actively investing in renewable energy production (solar PV, geothermal) to reduce dependency on fossil fuels, targeting emission reductions and energy efficiency improvements.

Summary:

The local energy consumption in Alba Iulia is primarily based on **natural gas, diesel, gasoline, and electricity** with significant CO₂ emissions especially associated with natural gas combustion for heating and fossil fuels used in transport. Renewable energy sources such as solar PV and geothermal provide a growing share of low-carbon energy, mitigating CO₂ emissions.

Methane and nitrous oxide emissions exist but in minor quantities with no detailed quantification. The F- gases group including SF₆ and NF₃ are not reported explicitly, suggesting insignificant levels.

GHG EMISSIONS BY SOURCE SECTORS

→ **Indicate the base year:** 2021

→ **Indicate the unit:** tons CO₂ equivalent per year (t CO₂ eq./year)

Table 8 GHG emissions by source sectors

	SCOPE 1	SCOPE 2	SCOPE 3*	TOTAL
BUILDINGS	90,239	68,790	-	159,029
TRANSPORT	49,547	-	-	49,547
WASTE	10,429	-	-	10,429

INDUSTRIAL PROCESS AND PRODUCT USE (IPPU)	-		-	-
AGRICULTURAL, FORESTRY AND LAND USE (AFOLU)	-	-	-	-
TOTAL	150,215	68,790	-	219,005

→ **Indicate the unit:** tonnes CO₂ equivalent per year (t CO₂ eq./year)

Table 9 GHG emission reduction proposed

	SCOPE 1	SCOPE 2	SCOPE 3*	TOTAL
BUILDINGS	76,703.15t CO ₂ reduction	58,471.50t CO ₂ Reduction	0 t CO ₂ reduction	Total approx. 135,174.65 t CO₂ eq./year
TRANSPORT	44,388.00t CO ₂ reduction	0 t CO ₂ Reduction	0 t CO ₂ reduction	Total approx. 44,388.00 t CO₂ eq./year

WASTE	8,864.90t CO2 reduction	0 t CO2 reduction	0 t CO2 reduction	Total approx. 8,864.90 t CO2 eq./year
INDUSTRIAL PROCESS AND PRODUCT USE (IPPU)	0 t CO2 reduction	0 t CO2 reduction	0 t CO2 reduction	Total approx. 0 t CO2 eq./year
AGRICULTURAL, FORESTRY AND LAND USE (AFOLU)	0 t CO2 reduction	0 t CO2 reduction	0 t CO2 reduction	Total approx. 0 t CO2 eq./year
TOTAL	Approximately 129,956.05	Approximately 58,471.5	0.00	Approximately 188,427.55

Details:

- **SCOPE 1** (Direct emissions): Includes fuel consumption for heating in buildings and combustion emissions from transport (private, public, and municipal vehicles). The estimate is approximate, based on total emissions from buildings and transport sectors.
- **SCOPE 2** (Indirect emissions from electricity): Comes from electricity consumption for buildings, public lighting, and other sectors, representing about 33% of total emissions.
- **SCOPE 3** (Other indirect emissions): Not detailed or quantified in the analyzed Alba Iulia documents.
- **TOTAL** is according to official baseline inventory data for the year 2021

Explanation:

- The base year for GHG emission data and energy consumption monitoring in Alba Iulia is 2021
- Emissions are reported in tonnes CO2 equivalent per year.
- Scope 1 emissions include direct on-site fuel combustion in buildings and direct vehicle emissions.
- Scope 2 emissions include indirect emissions associated with electricity consumption, which is notable due to the fossil fuel mix in regional electricity generation.
- Data on Scope 3 emissions and sectors such as IPPU, and AFOLU are not available or not detailed in the provided documents.
- Total CO₂ emissions reported for 2021 equal approximately 219,015 tCO₂ per year.

PLANNED ACTIONS BY SOURCE SECTORS

The table categorises emission reductions from each action, based on the scope they affect. For instance, if the covered actions aim to decrease CO₂ emissions linked to grid-supplied electricity, values will be assigned to Scope 2.

→ If the activities are intended to be finalised by 2035, the base year should be adjusted accordingly to 2035.

In the context of the Alba Iulia Municipality's commitment to sustainable development and the reduction of greenhouse gas emissions, the Sustainable Energy and Climate Action Plan (SECAP) 2030 represents a fundamental strategic framework for implementing energy efficiency measures and the use of renewable energy sources. This plan includes a well-defined set of planned actions aimed at reducing CO₂ emissions generated both directly and indirectly through interventions in various energy-consuming sectors such as public and residential buildings, transportation, public lighting, and local renewable energy production.

For effective monitoring and accurate assessment of the impact of these measures, the plan adjusts the reference baseline to the year 2035, the anticipated date for the completion of the planned actions. Thus, emission reductions are estimated and categorized according to international standards, using the three categories classification—Scope 1 (direct emissions), Scope 2 (indirect emissions from electricity consumption), and Scope 3 (other indirect emissions). This integrated approach aims not only to achieve the targets committed under the Covenant of Mayors but also to promote a model of intelligent, sustainable, and replicable urban development at the national and European levels.

Table 10 Planned actions by source sector

TARGET YEAR: 2035	SCOPE 1	SCOPE 2	SCOPE 3
BUILDINGS	76,814.30 t/year	58,471.90 t/year	0 t/year
- Biomass cogeneration for tertiary buildings - Biogas energy production from wastewater treatment - Solar thermal and photovoltaic installations on buildings by private owners (planned) - Thermal insulation and modernization of heating systems (estimated),	2,000 t CO2 reduction 2,000 t CO2 reduction 15,000 t CO2 reduction 36,050.80 t CO2 reduction	6,000 t CO2 reduction 33,000 t CO2 reduction	
Local renewable electricity production to offset grid electricity emissions ,		7,000 t CO2 reduction	
Indirect reductions from improved energy literacy and awareness		71.90 t CO2 reduction	
Barabant School public rehabilitation and energy efficiency - PT	200 t CO2 reduction	20 t CO2 reduction	
Livezii street nursery rehabilitation - SF	250 t CO2 reduction	20 t CO2 reduction	
Renovation of the former Dacia cinema	200 t CO2 reduction	20 t CO2 reduction	
Mamut bike path construction - SF	300 t CO2 reduction	30 t CO2 reduction	
Energy efficiency of residential buildings	10895 t CO2 reduction	6860 t CO2 reduction	

Green roof / attic / asbestos roof evaluation	1000 t CO2 reduction	400t CO2 reduction	
Development of energy communities	500 t CO2 reduction	50 t CO2 reduction	
Valuing the interior spaces of the Alba Carolina Fortress	50 t CO2 reduction		
Projects on Energy efficiency and resilience in 7 public buildings (headquarters of the City Police, preschools, schools and highschools) ONGOING PROJECTS	5 t CO2 reduction	1400 t CO2 reduction	
Construction of "The Regional Consortium for Career Support, Non- formal, Dual, and Technological Education Alba – CRESCENDO" ONGOING PROJECT	100 t CO2 reduction		
Projects on Energy efficiency and resilience in residential buildings (12 buildings) ONGOING PROJECTS	8263,50 tCO2/an	3600 tCO2/an	
TRANSPORT	44,388.00 t/year	0 t/year	0 t/year
- Promotion of sustainable mobility measures and green technologies (estimated)	21,000 t CO2 reduction		

- Transition of municipal			
fleet to clean vehicles (minor emissions reduction 86 t in 2008, potential increase in efficiency)			
- Encouragement of low emission transport modes reducing grid electricity demand (estimated)	10,000 t CO2 reduction		
Behavioral changes and modal shifts via awareness campaigns	500 t CO2 reduction		
Full clean public transport fleet in the metropolitan area, eco buses and eco cars replacing all the polluting vehicles. (130 ecologic buses available at metropolitan area)	5,500 t CO2 reduction		

2 Green belts to avoid traffic inside the city for people passing by - together with a park and ride system implemented at the entrance in the city. Projects prioritized in the ISUD of Alba Iulia Municipality and they will receive funding soon. Both belts are in the feasibility study phase. Also, in the discussion with local stakeholders the idea of a highway for bikes also appeared - is to be considered when updating the strategic documents.	500 t CO2 reduction		
Enhancing the existing infrastructure for railway transportation at metropolitan level -	2295 t CO2 reduction		
Partnerships with Different cities/ rural areas, but as well with the Ministry of Transportation and Railway Infrastructure Romania. Pre-feasibility study finalized. Alba Iulia is in direct work discussion with the ministry of transportation and the local authorities involved.	10 t CO2 reduction		

Bridge over Ampoi in the Ampoi neighborhood area - continuing Fabricilor Street	10 t CO2 reduction		
Bridge over Ampoi in the Barabant neighborhood area			
Construction of an artery as a green mobility corridor on the southwest side of Alba Iulia Municipality	300 t CO2 reduction		
N-W traffic decongestion, Alba Iulia Municipality DN 74 - construction of an underpass in the Unirea Stadium area at the intersection of Republicii Boulevard and Revolutiei 1989 Boulevard	200 t CO2 reduction		
New sustainable urban mobility corridor - Gh Sincai - Multifunctional Center - with connection to the Northern Beltway Zenit Street	300 t CO2 reduction		
Bicycle highway	180 t CO2 reduction		

Bridge over Ampoi in the Ampoi neighborhood area - continuing Fabricilor Street Bridge over Ampoi in the Barabant Neighborhood area Construction of an artery as a green mobility corridor on the southwest side of Alba Iulia Municipality N-W traffic decongestion, Alba Iulia Municipality DN 74 - construction of an underpass in the Unirea Stadium area at the intersection of Republicii Boulevard and Revolutiei 1989 Boulevard". New urban mobility corridor - Gh Sincai - Multifunctional Center - with connection to the Northern Beltway Zenit Street Green bicycle corridor connecting Alba Iulia Municipality with the Ciugud economic zone			
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Purchase of environmentally friendly means of transport at the metropolitan area level - AIDA TL Expansion / modernization of alternative metropolitan public transport infrastructure	300 t CO2 reduction		
Local public transport bus depot	50 t CO2 reduction		
Closed traffic for cars and transformed into a pedestrian area	500 t CO2 reduction		
Introducing local electric public transport in the fortress (exterior and entrenchments)	400 t CO2 reduction		
Reabilitare infrastructură rețea majoră de transport public urban din municipiul Alba Iulia - Lot 1 ONGOING	638,9 t CO2 reduction		
Reabilitare infrastructură rețea majoră de transport public urban din municipiul Alba Iulia - Lot 2 ONGOING	657,7 t CO2 reduction		

Achiziție mijloace de transport public - autobuze electrice 12 m șes, Alba Iulia, Buzău, Constanța, Ploiești ONGOING	603 t CO2 reduction		
Green Corridor - SE ringroad (aprox 30 mil euros) ONGOING	100 t CO2 reduction		
FARES - park and ride and Bus depot for electric buses (for 45 buses) (11 mil euros) ONGOING	253.40 t CO2 reduction		
Mamut Bike lane continuation (2.5 mil euros aprox 2.5 km) ONGOING	5 t CO2 reduction		
Public lightning on led (POR and AFM) - with telemanagement - aprox 16 mil euros (almost 90% of the public lightning is	50 t CO2 reduction		
covered) ONGOING			
Procurement of public transport means – electric buses and minibuses ONGOING (34 electric buses in total and 7 minibuses with charging infrastructure - out of 55 existing buses at local level) ONGOING	20 t CO2 reduction		
Charging stations for electric cars (POR + PNRR for public/private buildings and public spaces, excluding the ones for buses) 54 charging stations ONGOING	5 t CO2 reduction		

Development of the intelligent urban management system at the level of Alba Iulia Municipality through an e- ticketing system that allows payment of travel tickets including with a bank card (display, bus stations, e- ticketing machines in bus stations and in the buses)- 4 mil euros ONGOING	10 t CO2 reduction		
WASTE	8,864.90 t/year	0 t/year	Not quantified; possible indirect benefits from waste management improvements and circular economy measures.
Energy recovery from biogas at wastewater treatment stations (PE4)	4,964.90 t CO2 reduction		
Promotion of electric public transport and sustainable mobility for waste collection)	3,500 t CO2 reduction		
Expand waste collection	200 t CO2 reduction		

with smart systems: 100 on-ground waste islands have been installed with EU funding, and several neighborhoods feature smart underground systems. By 2030, Alba Iulia will have a modernized network with resident-only cards, intelligent monitoring, fill-level detection, pay-as-you-throw, photovoltaic panels, and video surveillance. By 2035, the smart waste system will extend to the metropolitan area, in collaboration with Alba County on a compliant smart waste plant.			
Digitized Ecologic Islands ONGOING PROJECT	95 t CO2 reduction		
Waste collection center by voluntary contribution ONGOING PROJECT	5 t CO2 reduction		

Zero Waste certification for public buildings - not only the ones owned by the municipality but also in close partnership with all the public institutions from Alba Iulia and the ones active at metropolitan level. This will ensure the prevention of waste generation at source, 12 fractions waste collection system, training for building administrators, smart monitoring and reporting etc.	100 t CO2 reduction		
INDUSTRIAL PROCESS AND	Not reported or targeted	Not reported or targeted	Not reported or targeted
PRODUCT USE (IPPU)	(industrial sector excluded from SECAP)	(industrial sector excluded from SECAP)	(industrial sector excluded from SECAP)
COVERED ACTIONS (insert covered actions here)	Installation of additional PVs in Alba Iulia, for a total capacity of extra 31 MW created		
Facilities from local/central administration for economic sector to develop clean economy	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)
Signing and implementation of LGDS in the field clean economy	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)
PPPs for green projects at local level, CSR (such as new green spaces, smart technologies for air quality monitoring)	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)

Adapted energy efficiency programs for private companies at local/ metropolitan level	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)	Not reported or targeted (industrial sector excluded from SECAP)
AGRICULTURAL, FORESTRY AND LAND USE (AFOLU)	1200 t CO2 reduction Not applicable Not applicable	Not applicable	Not applicable
Developing a Regional Agro Hub in Alba Iulia North Park stage 2 - Micesti	835t CO2 reduction		
Carolina fortress Promoting UATs - (including relevant local producers) from the metropolitan area	<i>200 t CO2 reduction</i>		
Promoting urban agriculture and smart irrigation systems for drought adaptation.	10 t CO2 reduction		
Creating reservoir for collecting rain waters to be used for local agriculture/ local production	<i>5 t CO2 reduction</i>		
Creating the necessary infrastructure for encouraging compost	<i>10 t CO2 reduction</i>		
Ongoing campaign to collect green waste from gardens at local level	10 t CO2 reduction		

Testing the campaign with providing free recipients to residents willing to create compost	10 t CO2 reduction		
5 Urban Forest ONGOING PROJECT	20 t CO2 reduction		
Blue - Green infrastructure ONGOING PROJECTS	100 t CO2 reduction		
Urban regeneration of the park line			
OTHER			
Setting up a one-stop shop for energy services, aiding public institutions, individuals, companies, and industries. This service will promote funding opportunities, offer project management, and assist with grants like the Green House Program and energy efficiency programs. It also tackles energy poverty by leveraging renewable		200 t CO2 reduction 30 t CO2 reduction	30 t CO2 reduction

sources such as geothermal heat pumps and solar panels. Community Energy Managers are in place to provide technical support and manage energy and GHG inventories.			
SECAP extension at metropolitan area - within the Covenant of the mayors			
Interventions proposed from NGOs, companies, institutions, metropolitan area: new green spaces, bike safety measures, electric buses for schools, nature-based solutions, urban gardens, compost bins, tree planting, improved green space access, eco heating/cooling systems, 2026 recertification as a Sustainable Community under the EEA, financial backing for PEDs, using schools for energy-positive neighborhoods, training, green infrastructure irrigation, and replacing asbestos		20 t CO ₂ reduction	

roofs with eco-friendly options			
Water improvement at metropolitan area, in connection with the Water company and new	200 t CO2 reduction	50 t CO2 reduction	
technologies. Also, implementation of storage for rain waters to be collected in order to be used by the municipality (local communities from metropolitan area) for different public services: irrigation, eco cleaning, air cooling etc.			

Urban regeneration of the central area (the area between Ardealului Street, Teilor Street, Ion Luca Caragiale Park, Alessandria Square and IC Brătianu Square)	200 t CO2 reduction	50 t CO2 reduction	
REGENERATION OF PUBLIC RECREATIONAL SPACE - Alba Iulia Schit Area	400 t CO2 reduction		
Urban regeneration of the blue green corridor - Ampoi District	200 t CO2 reduction		
Modernization of the ambulance service. And the creation of geriatrics / palliative care / multifunctional medical center services	500t CO2 reduction		
Expanding the network of urban gardens / green areas / urban forests / parks (Pilot projects also around city roads: Calea Motilor str, from City Hall to str. Aurel Vlaicu or entrance in Alba Iulia from direction Cluj Napoca)	200 t CO2 reduction	200 t CO2 reduction	
Design and implementation of a shadow corners in the cities (equipped with shadow, ventilators and drinking water) to	30 t CO2 reduction		

be used during high temperatures			
Adopting the “Sponge City” concept involves integrating sustainable solutions for stormwater management, such as absorbent green areas, permeable pavements, and retention basins. These measures reduce flood risk, improve water infiltration, and increase urban resilience to climate change	50 t CO2 reduction		
Alba Iulia City Hall's investments will also have a carbon footprint calculation (Life Cycle Assessment – LCA) throughout the entire life cycle, which would contribute to achieving the climate neutrality target.	50 t CO2 reduction		
Promoting Green Friday	160 t CO2 reduction		
Creation of reservoirs and water storage systems for urban and agricultural consumption.	10 t CO2 reduction		

RENEWABLE ENERGY GENERATION	4,800 t/year		
Implementation of PEDs and Energy Communities: pilot sites with at least 4 neighborhoods from Alba Iulia Municipality using local renewable energy sources and energy storage systems, under several international consortium projects on Horizon, EEA Interreg initiatives. The Positive Energy District will also be extended at metropolitan level developing the concept for rural positive energy communities, as this initiative is already ongoing through a Norwegian project in Alba Iulia.	800 t CO2 reduction		
The Construction of Photovoltaic parks will not only ensure the consumption need for the public buildings and public street lighting system as mentioned above, but it will also cover the entire consumption necessity for all the other public sectors of activity, especially the public transportation EV charging.	600 t CO2 reduction		

Setting up a one-stop shop for energy services, aiding public institutions, individuals, companies, and industries. This service will promote funding opportunities, offer project		<i>50 t CO2 reduction</i>	
management, and assist with grants like the Green House Program and energy efficiency programs. It also tackles energy poverty by leveraging renewable sources such as geothermal heat pumps and solar panels. Community Energy Managers are in place to provide technical support and manage energy and GHG inventories.			
2 Photovoltaic Parks created 1 MW (774 KW parc and the difference for 5 public buildings) and the second Park is 3 MW - SF realized (ONGOING) aprox 5 mil euros ONGOING	<i>100 t CO2 reduction</i>		

Installation of additional PVs in Alba Iulia, for a total capacity of extra 31 MW created (for a total of 35 MW at the end of implementation of CCC). Batteries included for an efficient use of the Renewable energy created.			
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EMISSIONS GAP

Table 11 Emissions GAP

	BASELINE EMISSIONS (PERCENTAGE)		**RESIDUAL EMISSIONS / OFFSETTING		BASELINE EMISSIONS REDUCTION TARGET 86% BY 2035 ²		EMISSIONS REDUCTIONS IN EXISTING STRATEGIES		EMISSIONS GAP (TO BE ADDRESSED BY THE ACTION PLAN)	
	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)	(absolute)	(%)
BUILDINGS	159,029	73%	23,874	78%	135,286	72%	135,286	72%	23,874	78%
TRANSPORT	49,547	22%	5,038	17%	44,388	23%	44,388	23%	5,038	17%
WASTE	10,429	5%	1,564	5%	8,865	5%	8,865	5%	1,564	5%
INDUSTRIAL PROCESS AND	0	0%	0	0%		0%	0	0%	0	0%
PRODUCT USE (IPPU)	0	0%	0	0%	0	0%	0	0%	0	0%
AGRICULTURE, FORESTRY AND LAND USE (AFOLU)	0	0%	0	0%	0	0%	0	0%	0	0%
TOTAL	219,005	100%	30,476	100%	188,539	100%	188,539	100%	30,476	100%

Notes on table data sources and assumptions:

- Baseline Emissions are the emissions associated with each sector for the year 2021 calculated in both absolute and percentage values.
- Residual Emissions are emissions difficult or costly to abate by 2035
- Reduction Targets reflect official targets (e.g., ~20-60%) from strategy documents like SECAP 2030 and other climate action plans, completed by the Waste category.
- Emission Reductions in Existing Strategies quantify what has already been realized or programmed through adopted measures as indicated by the SECAP 2030.
- Emissions Gap represents remaining emissions after subtracting reductions achieved and planned from baseline, identifying the scope for future action plans.

CURRENT POLICIES AND STRATEGIES

Provide a short contextual presentation and assessment of the policies, strategies, initiatives, and / or regulations at the local, regional and national levels which are relevant to the city's transition towards climate neutrality.

(insert here: text + if necessary, relevant visuals - pictures, figures, charts)

Alba Iulia operates within a comprehensive policy framework at the local, regional, and national levels aimed at advancing sustainable development and achieving climate neutrality. At the **national level**, Romania aligns its climate and energy policies with European Union (EU) directives and strategies, including the European Green Deal and the EU Climate Law, which set binding targets for GHG emission reductions (e.g., 55% reduction by 2030 and climate neutrality by 2050). The Romanian government has adopted several legislative instruments and strategic plans, such as the **National Energy and Climate Plan (NECP)**, which guides sectoral efforts across energy, transport, and industry sectors.

At the European, national, **regional and local levels**, Alba Iulia has adopted specific strategies and initiatives to implement these policies:

- New Leipzig Charter (2020), Urban Agenda of the EU, The European Green Deal, 100 Climate-Neutral Cities by 2030, Digital Agenda and Smart Cities
- The **Smart City Strategy (2021-2030)** focuses on energy efficiency, renewable energy deployment, sustainable mobility, and smart infrastructure.
- The **Climate Change Mitigation and Adaptation Plan (PAASC)(2021-2030)** aligns with national and European directives, emphasizing climate resilience, emission reduction, and sustainable urban development.
- Local initiatives include the **Energy Action Plan** and carbon mitigation projects targeting renewable energy, energy efficiency, and waste management
- **Energy efficiency improvement program (PIEE)**
- **Circular Economy Action Plan of Alba Iulia Municipality 2023-2033**
- **Study on the impact of climate change on local producers in Bărăbanț neighborhood of Alba Iulia municipality**
- **The Sustainable Urban Mobility Plan of Alba Iulia Municipality 2030**
- **The Green City Action Plan** financed by EBRD
- National Strategy on Adaptation to Climate Change (SNASC) 2024-2030
- National Strategy for Sustainable Development 2030 (SNDD 2030)
- NATIONAL INTEGRATED URBAN DEVELOPMENT STRATEGY FOR RESILIENT, GREEN, INCLUSIVE AND



COMPETITIVE CITIES 2022-2035

- Romania's Territorial Development Strategy
- Center Region Development Strategy 2021-2027
- Smart Specialization Strategy of the Central Region

Furthermore, Alba Iulia is a signatory of the **Conventia Primarilor privind Clima și Energia** (Mayors' Convention on Climate and Energy), demonstrating local commitment to European climate targets and signatory of the **Green City Accord**.

Starting from the fall of 2023, Alba Iulia has joined over 100 European cities actively participating in ICC, an initiative based on cutting-edge technologies, supports the green and digital transition of cities, improving economic competitiveness, social resilience and their citizens' quality of life.

Being part of the M100 Hub Alba Iulia will also adopt the CCC as part of the commitment for Climate neutrality.

Alba Iulia's ambition to reduce greenhouse gas (GHG) emissions and CO₂ by at least **85% by 2035** is anchored in a robust portfolio of interconnected European, national, regional, and local strategies. These frameworks provide both the **direction** and the **operational tools** needed to ensure that the city's Climate City Contract (CCC) translates into measurable results and durable systemic change.

European and International Alignment

The municipality positions itself firmly within the European vision for sustainable and inclusive urban development. The **New Leipzig Charter (2020)** and the **Urban Agenda of the EU** emphasize integrated, participatory, and place-based approaches, all of which underpin Alba Iulia's planning and governance. The **European Green Deal** provides the overarching climate neutrality target for the EU, while the **"100 Climate-Neutral Cities by 2030" mission** offers a pioneering framework in which Alba Iulia aims to act as both a frontrunner and replicable model. Complementing these, the **Digital Agenda and Smart Cities initiatives** ensure that digitalization and innovation are fully leveraged to decarbonize services and infrastructure.

Local Strategic Framework

At the municipal level, Alba Iulia has adopted a set of forward-looking strategies:

- The **Smart City Strategy (2021–2030)** focuses on integrating energy efficiency, renewable energy deployment, sustainable mobility, and digital infrastructure, thus supporting systemic decarbonization of both energy supply and demand.
- The **Climate Change Mitigation and Adaptation Plan (PAASC) (2021–2030)** ensures alignment with both national and EU directives, translating high-level climate objectives into actionable measures at the local scale.
- The **Energy Efficiency Improvement Program (PIEE)** and the **Energy Action Plan** provide concrete mechanisms to achieve reductions in consumption and emissions across buildings, industry, and public services.
- The **Circular Economy Action Plan (2023–2033)** adds a systemic dimension by tackling resource efficiency, waste reduction, and sustainable production models, ensuring that



climate neutrality is pursued hand in hand with sustainable economic practices.

- A **Study on the Impact of Climate Change on Local Producers in Bărbant** offers granular, neighborhood-level insights into the vulnerabilities and adaptive capacity of the community, thereby linking climate strategy to local livelihoods.

Sector-Specific Pathways

- The **Sustainable Urban Mobility Plan (2030)** underpins a low-carbon transport transition, prioritizing integrated public transport, active mobility, and the electrification of fleets.
- The **Green City Action Plan (EBRD-financed)** provides a bankable pipeline of green investments, ensuring that environmental and climate priorities are embedded into the city's long-term financial planning.

National and Regional Coherence

Alba Iulia's ambition is further reinforced by alignment with national frameworks such as the **National Strategy on Adaptation to Climate Change (SNASC 2024–2030)**, the **National Strategy for Sustainable Development 2030 (SNDD 2030)**, and the **National Integrated Urban Development Strategy for Resilient, Green, Inclusive, and Competitive Cities (2022–2035)**. Together, these provide consistency across policy levels and ensure that municipal projects can tap into national funding, technical assistance, and regulatory support. At the regional level, the **Center Region Development Strategy (2021–2027)** and the **Smart Specialization Strategy of the Central Region** reinforce Alba Iulia's integration into territorial development goals and innovation-driven growth pathways. These synergies strengthen access to European funds and encourage collaboration with other municipalities.

Strategic Value

By embedding its ambition across this interconnected web of strategies, Alba Iulia ensures that its pathway to an **AT LEAST 85% GHG reduction by 2035** is not isolated but **systematically reinforced** by EU, national, regional, and local frameworks. This approach maximizes opportunities for co-financing, ensures policy coherence, and enhances the city's ability to demonstrate leadership not only at the local but also at the national and European levels.



Alba Iulia receives external expertise from relevant experts at EU level and it managed to sign 6 LGDS (among the first cities in Romania) to develop Local Green Deals with private partners). Main fields focused on are Tourism, Mobility and Energy.

Recently, based on the LGD activities within the ICC, Alba Iulia prepared together with other partners, such as Fraunhofer as Coordinator, ICLEI and Cluj-Napoca City Hall, a project proposal for the call "Changing urban spaces and mindsets to accelerate the transition to climate neutrality" within Horizon Europe.

Assessment:

The policy landscape demonstrates a **multi-level approach** where local initiatives are designed to complement and fulfill national and European commitments. The alignment ensures that Alba Iulia's projects and strategies are part of broader sustainable development goals, notably the EU Climate and Energy Framework and Romania's national legislation (e.g., Law No. 121/2014 on Energy Efficiency and Law No. 372/2005 on Building Performance).

The initiatives such as the **Energy Action Plan** and **climate adaptation strategies** are geared towards increasing renewable energy share, improving energy efficiency, reducing GHG emissions, and enhancing urban resilience. These efforts are supported by European funding mechanisms, notably the **European Investment Bank (EIB)**, **World Bank**, **EBRD** and the **European Green Deal**, which facilitate investments in sustainable infrastructure and climate resilience.

Strengths:

- Clear alignment with EU and national targets.
- Active engagement through international commitments (e.g., Convenția Primarilor).
- Integrated strategies targeting multiple sectors and stakeholders.

Challenges:

- The need for accelerated implementation of projects, especially in renewable energy and mobility.
- Ensuring investment in climate resilience and adaptation measures.
- Coordinating policies across levels for maximum impact.

RELEVANT POLICIES, STRATEGIES, INITIATIVES, REGULATIONS

Table 11 Relevant policies, strategies, initiatives, regulations

TYPE	LEVEL	TITLE	DESCRIPTION	RELEVANCE	NEED FOR ACTION
Policy/Strategy	National	Romania's Climate and Energy Framework	Includes the National Energy and Climate Plan (NECP) 2021-2030, aligned with the EU, setting targets for GHG reductions, renewable energy share, and energy efficiency.	Fundamental for aligning local efforts with national commitments; defines legal and strategic context.	Strengthen implementation mechanisms; integrate local actions; ensure sufficient funding for ambitious targets
Policy/Strategy	Regional/Local	Alba Iulia Sustainable Urban Development Strategy (SUDS) 2030 - Green and Resilient City Strategy	Local strategy focusing on energy efficiency, green infrastructure, climate change mitigation and adaptation, and sustainable urban development.	Guides local planning and investments towards climate neutrality; promotes cross-sectoral approaches.	Enhance policy integration; develop detailed implementation plans; improve monitoring and reporting.
Initiative	European	EU Climate Law & Green Deal	Sets binding targets for GHG reductions (55% by 2030, climate neutrality by 2050), European-wide policies for renewable energy, energy efficiency, and carbon neutrality.	Provides the overarching legal and policy framework; influences national and local policies.	Accelerate local projects to meet EU targets; align funding and policy instruments.

Regulation	National	Ordinance No. 121/2014 on Energy Efficiency	Establishes legal obligations for energy savings in public buildings, transport, and industry.	Critical for enforcing energy efficiency measures at local and regional levels.	Improve enforcement; expand scope; boost awareness and capacity building.
Initiative	Local	Alba Iulia Circular Economy Strategy (2023)	First circular economy strategy approved locally, focusing on waste reduction, resource efficiency, and	Addresses resource efficiency, crucial for climate mitigation and adaptation.	Implement concrete projects; monitor circular economy indicators; raise public awareness.
			sustainable consumption.		
Policy/Strategy	Regional/National	National Adaptation Strategy (2021-2030)	Focuses on climate resilience, green-blue infrastructure, and adaptation measures for climate impacts.	Supports local adaptation efforts; enhances resilience of urban infrastructure.	Develop detailed local adaptation plans; increase investments in green infrastructure.
Initiative	European	Horizon Europe Projects (e.g., Flex2Energy & InterPed)	R&I projects aimed at greening social housing and integrated planning of Positive Energy Districts.	Foster innovation; demonstrate pilot solutions; accelerate transition to sustainable urban areas.	Scale pilot successes; integrate results into local policies; secure long-term funding.
Policy/Strategy	Local	Smart City Strategy (2021-2030)	Focuses on smart urban development at local level	Foster innovation; demonstrate pilot solutions; accelerate transition to sustainable urban areas.	Ongoing projects under implementation
Policy/Strategy	Local	Climate Change Mitigation and Adaptation Plan (PAASC)(2021-2030)	Focuses on climate change mitigation and adaptation measures	Foster cooperation between several stakeholders in the field of Sustainable	Identify adapted financing schemes and instruments to support the climate change

				urban development	adaptation of the local community
Policy/Strategy	Local /with national reporting annually	Energy efficiency improvement program (PIEE)	Focuses on energy efficiency projects	Foster the use of renewable energies and synergies with other local investments reducing the CO2 emissions in every development field	Identify adapted financing schemes and instruments to support the energy efficiency
Policy/Strategy	Local	Study on the impact of climate change on local producers in Bărbant neighborhood of Alba Iulia municipality	Focuses on the impact of climate change to the local producers in a pilot area of the city (prior being a rural area)	Monitor how climate change affect local producers and identify measures to support tackling the challenges that producers face due to climate change Reduce the flooding areas in the city	Collaboration with the local producers, identifying projects to support the local production and enhance economy based on the healthy food
Policy/Strategy	Local	The Sustainable Urban Mobility Plan of Alba Iulia Municipality 2030	Sustainable urban mobility plan - supporting the use of the Cohesion funding for transportation at local level with impact also to the metropolitan area	Increase connectivity, reduce pollution resulting from transport field, increase security of all participants in the traffic	Investments in mobility infrastructure, connectivity, safety etc
Policy/Strategy	National	National Strategy on Adaptation to Climate Change 2024-2030	National plan to increase resilience and adaptive capacity to climate change (2024–2030; perspective 2050)	Guides local flood, heat and drought risk management, and climate-proofing of Alba Iulia's infrastructure and services.	Conduct local vulnerability assessment; integrate adaptation into urban planning, green infrastructure, emergency response, and

					funding applications.
Policy/Strategy	National	National Strategy for Sustainable Development 2030 (SNDD 2030)	National framework aligning Romania with SDGs — sustainable economy, social cohesion, and environmental protection to 2030	Sets national targets (poverty, transport, energy, circular economy) that should steer Alba Iulia's municipal policies	Map municipal projects to SDG targets; adopt local sustainability indicators; prioritise projects for national/EU funding
Policy/Strategy	National	National Integrated Urban Development Strategy for Resilient, Green, Inclusive and Competitive Cities 2022-2035	National urban policy promoting resilient, green, inclusive, competitive cities (2022–2035) and sustainable urban mobility	Directly frames urban regeneration, sustainable mobility, housing, energy efficiency and public space interventions in Alba Iulia	Produce an integrated urban plan; prioritise sustainable mobility, building retrofit, green public space; apply to urban funding programmes
Policy/Strategy	National	Romania's Territorial Development Strategy	Spatial planning framework coordinating regional, county and local development and infrastructure toward 2035	Shapes land-use, green belts, transport corridors and investment allocations that affect Alba Iulia's expansion and zoning	Align local masterplan with territorial priorities; protect peri-urban green belts; coordinate cross-level projects with county/region
Policy/Strategy	National	Center Region Development Strategy 2021-2027	Regional development plan for Centru Region (2021–2027) setting investment priorities, strategic projects and programming for EU funds	Determines regional funding windows and priority sectors (innovation, infrastructure, tourism) Alba Iulia can apply for funding under SUD priorities	Prepare shovel-ready projects aligned to regional priorities; engage ADR Centru early; submit competitive grant applications.

Policy/Strategy	National	Smart Specialization Strategy of the Center Region	RIS3 Centru (2021–2027) identifies regional innovation priorities (automotive, IT/creative, e-health, sustainable built environment, tourism)	Channels RDI funding and cluster development that can modernize Alba Iulia's economy and support local SMEs/universities	Join entrepreneurial discovery processes; connect local universities/SMEs to RIS3 clusters; design innovation projects for RIS3/OP calls
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ACTION PORTFOLIO

For each action aimed at achieving climate neutrality as outlined in this Plan, fill out a sheet using the template provided below.

- Make sure to also include, within this section, the actions pertaining to Organisational and Governance Innovation, as well as the actions related to Social and Other Innovation fields.

INDIVIDUAL ACTIONS

Action 1: Energy Systems, renewable energies, Energy efficiency in public and private buildings

ACTION TITLE	Energy Systems, renewable energies, Energy efficiency in public and private buildings
TYPE OF ACTION	Technological and Systemic Innovation
SCALE AND TARGET GROUP (ADDRESSED ENTITIES)	City-wide public buildings including government offices, schools, and cultural institutions City renewable energies expansion Energy efficiency in private buildings Renewable energies for the own consumption -public and private
FIELD OF ACTION	Energy Efficiency / Smart Buildings
SYSTEMIC LEVER	Digital Transition and Systemic Innovation
EMISSION DOMAIN(S)	Scope 1 & 2 CO ₂ emissions (energy use in buildings)
COVERED INTERVENTIONS	Installation of IoT sensors, implementation of energy monitoring platforms, automation of energy controls Install 35 MW of PV and wind microgrids → reduce 15,000 tCO₂e/year (approx. 10% of energy emissions) Thermal insulation / energy efficiency projects for buildings (advanced renovations)
BRIEF DESCRIPTION	Deployment of an integrated smart energy management system to optimize energy consumption in municipal buildings, reducing waste and improving energy efficiency.
OUTCOME	Reduced energy consumption, lower emissions, improved operational efficiency
RESPONSIBLE ENTITY / BODY / PERSON	Alba Iulia Municipality's Energy Department
INVOLVED STAKEHOLDERS	Local government, technology providers, energy managers, building managers, citizens, t, Residents associations, Economic entities, NGOs

GHG EMISSIONS REDUCTION ESTIMATE (TOTAL) PER EMISSION SOURCE SECTOR	1500 tCO ₂ e/year
% OF TOTAL CO₂ REDUCTION	Approximately 72%
GENERATED RENEWABLE ENERGY (IF APPLICABLE)	Not directly; energy savings facilitate increased renewable integration
REMOVED / SUBSTITUTED ENERGY, VOLUME OR FUEL TYPE	Conventional electricity and heating fuels
TIMELINE (START AND END)	2024 – 2026

Action 2: Promotion of Sustainable Urban Mobility through Public Transport Electrification and green fleet

ACTION TITLE	Electric /Ecologic Public Transport Fleet Expansion
TYPE OF ACTION	Infrastructure and Organizational Innovation
SCALE AND TARGET GROUP (ADDRESSED ENTITIES)	City-wide public transport users and operators
FIELD OF ACTION	Sustainable Urban Mobility
SYSTEMIC LEVER	Policy and Governance Innovation
EMISSION DOMAIN(S)	Scope 1 (transportation emissions)
COVERED INTERVENTIONS	Procurement of electric buses, charging infrastructure development, fleet management restructuring
BRIEF DESCRIPTION	Transition from diesel-powered to electric buses to reduce emissions from urban transport, supported by policy incentives.
OUTCOME	Significant reduction in local transport emissions, improved air quality
RESPONSIBLE ENTITY / BODY / PERSON	Alba Iulia Transport Authority, Municipal Government
INVOLVED STAKEHOLDERS	Transport companies, citizens, vehicle manufacturers, energy providers

GHG EMISSIONS REDUCTION ESTIMATE (TOTAL) PER EMISSION SOURCE SECTOR	2000 tCO ₂ e/year
% OF TOTAL CO₂ REDUCTION	Approx. 15% of city-wide transportation emissions
GENERATED RENEWABLE ENERGY (IF APPLICABLE)	Ideally powered by locally sourced renewable energy
REMOVED / SUBSTITUTED ENERGY, VOLUME OR FUEL TYPE	Diesel fuel
TIMELINE (START AND END)	2024 – 2030

Action 3: Community Engagement and Social Innovation Program for Climate Awareness

ACTION TITLE	Climate Awareness and Citizens' Engagement Campaign
TYPE OF ACTION	Social and Organizational Innovation
SCALE AND TARGET GROUP (ADDRESSED ENTITIES)	Local residents, schools, NGOs, community groups
FIELD OF ACTION	Social Innovation / Capacity Building
SYSTEMIC LEVER	Social Innovation and Governance
EMISSION DOMAIN(S)	Direct behavioral emission reductions through lifestyle changes
COVERED INTERVENTIONS	Educational campaigns, workshops, citizen science initiatives, local climate action events
BRIEF DESCRIPTION	Engaging citizens in climate action by raising awareness and fostering behavioral changes to reduce energy use and promote sustainable practices.
OUTCOME	Increased public participation, behavioral shifts towards sustainable habits, community-driven emissions reductions
RESPONSIBLE ENTITY / BODY / PERSON	City Communications Office, NGOs, Schools

INVOLVED STAKEHOLDERS	Citizens, schools, NGOs, local media
GHG EMISSIONS REDUCTION ESTIMATE (TOTAL) PER EMISSION SOURCE SECTOR	500 tCO ₂ e/year (behavioral changes)
% OF TOTAL CO₂ REDUCTION	Approx. 3-4% of total city reductions
GENERATED RENEWABLE ENERGY (IF APPLICABLE)	Not directly; supports behavior shifts towards renewable use
REMOVED / SUBSTITUTED ENERGY, VOLUME OR FUEL TYPE	Fossil fuels and high-energy consumption habits
TIMELINE (START AND END)	2024 – ongoing

Action 4: Implementation of Governance and Data Monitoring Platform

ACTION TITLE	Digital Governance and Data Monitoring Platform for Climate Action
TYPE OF ACTION	Organizational and Digital Innovation
SCALE AND TARGET GROUP (ADDRESSED ENTITIES)	Municipal administration, policy makers, data analysts
FIELD OF ACTION	Governance Innovation / Digital Transition
SYSTEMIC LEVER	Institutional and Governance Reform
EMISSION DOMAIN(S)	Cross-sectoral data-driven policy management
COVERED INTERVENTIONS	Development of an integrated data platform, training personnel, real-time reporting tools
BRIEF DESCRIPTION	Establishing a centralized platform to monitor, analyze, and report climate and energy metrics, improving policy responsiveness and transparency.
OUTCOME	Increased policy effectiveness, transparency, and accountability, enhanced capacity for adaptive management
RESPONSIBLE ENTITY / BODY / PERSON	Alba Iulia Municipality's IT Department and Climate Unit

INVOLVED STAKEHOLDERS	Local government, EU agencies, data providers, citizens
GHG EMISSIONS REDUCTION ESTIMATE (TOTAL) PER EMISSION SOURCE SECTOR	Indirect impact through better policy targeting (~300-500 tCO ₂ e/year)
% OF TOTAL CO₂ REDUCTION	~2-3%
GENERATED RENEWABLE ENERGY (IF APPLICABLE)	Not applicable; supports all fields through better data management
REMOVED / SUBSTITUTED ENERGY, VOLUME OR FUEL TYPE	Not directly; facilitates efficiencies across sectors
TIMELINE (START AND END)	2024 – 2025

Action 5: Waste management and circular economy

ACTION TITLE	Waste management and circular economy
TYPE OF ACTION	Waste management and circular economy
SCALE AND TARGET GROUP (ADDRESSED ENTITIES)	Alba Iulia Municipality
FIELD OF ACTION	Waste
SYSTEMIC LEVER	Technology Deployment, New infrastructure, circularity chain
EMISSION DOMAIN(S)	Scope 1
COVERED INTERVENTIONS	Installment of new infrastructure for waste management Developing a circular chain for waste and recycling materials

BRIEF DESCRIPTION	Energy recovery from biogas at wastewater treatment station Expand waste collection for 12 fractions – to serve also the metropolitan area Zero Waste certification for public buildings New collaborations with private sector for a new chain promoting circular economy and recycling in all sectors
OUTCOME	Significant reduction in CO2 emissions
RESPONSIBLE ENTITY / BODY / PERSON	Municipal Government
INVOLVED STAKEHOLDERS	Municipal Government, County Council, Waste management association, the 12 localities from the metropolitan area
GHG EMISSIONS REDUCTION ESTIMATE (TOTAL) PER EMISSION SOURCE SECTOR	Reduction of CO2 emissions- 8,864.90 t/year
% OF TOTAL CO2 REDUCTION	Approx. 100% of the city's energy need for own consumption, 5% of the city's entire reduction
GENERATED RENEWABLE ENERGY (IF APPLICABLE)	n/a
REMOVED / SUBSTITUTED ENERGY, VOLUME OR FUEL TYPE	n/a

Present the targeted actions grouped together according to each field of action. Use one sheet for each distinct field of action, following the template provided below.

- Make sure to also include within this section the actions pertaining to Organisational and Governance Innovation, as well as the actions related to Social and Other Innovation fields.

PORTOFOLIO OF ACTIONS

FIELD OF ACTION	Energy Systems, renewable energies, Energy efficiency in public and private buildings
LIST OF COVERED ACTIONS	Smart Energy Management for Public Buildings: Deployment of IoT sensors and energy monitoring platforms in municipal and public buildings to optimize energy use, reduce waste, and lower emissions (2024–2026). Residential Building Retrofit Program: Improving energy efficiency in residential housing through insulation, efficient heating, and smart controls, aiming to reduce annual energy consumption and associated GHG emissions. Public Lighting Modernization: Implementation of intelligent street lighting with remote management solutions to achieve at least 10% energy savings. Renewable Energy Generation from Local Sources: Developing local renewable energy projects (solar, wind) to supply municipal and public facilities, supporting decarbonization targets. Planning and Land Use for Renewable Deployment: Strategically planning land use to facilitate large-scale renewable integration and grid stability. Energy Purchase Policies Favoring Renewables: Implementing procurement policies prioritizing renewable energy for municipal operation Residential Housing Energy Retrofits: Improving existing residential buildings through insulation, window upgrades, and heating system modernization. Sustainable Urban Infrastructure: Developing green-blue infrastructure, such as parks, water retention systems, and urban forests, to enhance climate resilience and biodiversity. Healthy and Inclusive Housing Policies: Ensuring access to affordable, energy-efficient housing for all citizens, promoting social cohesion and climate adaptation.
FIELD OF ACTION	Sustainable Urban Mobility
LIST OF COVERED ACTIONS	Electric/green Public Transport Fleet Expansion: Procurement and deployment of electric buses and charging infrastructure to replace diesel-powered vehicles, reducing transportation emissions (2024– 2030). Promotion of Sustainable Mobility: Encouraging active mobility (cycling, walking) through infrastructure upgrades, awareness campaigns, and incentives. Smart Traffic Monitoring and Routing: Installing centralized traffic monitoring systems to optimize routing, reduce congestion, and lower vehicle emissions. Incentives for private sector (citizens and economic actors for adopting alternatives way of transportations/ eco vehicles). Including promotion of National programs for eligible entities / persons

FIELD OF ACTION	Community Engagement and Social Innovation Program for Climate Awareness
LIST OF COVERED ACTIONS	Climate Awareness and Citizens' Engagement Program: Campaigns, workshops, and citizen science initiatives to promote sustainable practices and behavioral change. Energy Communities and Cooperative Initiatives: Encouraging local energy communities to generate, share, and consume renewable energy collectively. Participatory Budgeting and Inclusive Planning: Engaging residents, especially disadvantaged groups, in decision-making processes related to climate actions and investments.
FIELD OF ACTION	Governance, Data Monitoring, and Digital Innovation
LIST OF COVERED ACTIONS	Digital Governance and Data Monitoring Platform: Creation of an integrated platform for real-time climate, energy, and emissions data collection, analysis, and reporting (2024–2025). Development of a Climate & Air Quality Monitoring System: Establishing sensors across the city to monitor air quality and inform policy actions. Citizen Engagement and Awareness Campaigns: Organizing workshops, participatory budgeting, and digital platforms to promote climate awareness and citizen participation in sustainability policies. Organizational Innovation in Governance: Full digitalization of local government processes to increase efficiency and transparency in climate and urban planning.
FIELD OF ACTION	Waste and Circular Economy
LIST OF COVERED ACTIONS	Recycling in 5 fractions & reuse of recycled construction materials: Implementing recycling measures at city level for 5 fractions: biodegradable waste, household waste, glass, paper, plastic. Also encouraging reuse of recycled materials from construction sites to reduce CO2 footprint and to reduce construction waste. Promotion of recycling activities among citizens: Encouraging active recycling through infrastructure upgrades, awareness campaigns, and incentives. Encourage circular economy fares: promote street fares for antique objects, antique object shops, supporting local appliances repairing shops etc

IMPACT PATHWAYS

Provide a brief description of the theory of change you will use to achieve climate neutrality.

- Use both textual and visual elements, as appropriate, to illustrate the impact pathways, which will be furtherly presented in the subsequent table.
- Make sure to also include within this section the actions pertaining to Organisational and Governance Innovation, as well as the actions related to Social and Other Innovation fields.

Table 12 Impact pathways

IMPACT PATHWAYS

FIELDS OF ACTION	SYSTEMIC LEVERS	EARLY CHANGES (1-2 YEARS)	LATE OUTCOMES (3-4 YEARS)	DIRECT IMPACTS (EMISSION REDUCTIONS)	INDIRECT IMPACTS (CO-BENEFITS)
Renewable Energy Production & Integration	- Technology / Infrastructure - Finance & Funding - Governance & Policy	- Launch of small-scale solar/wind projects - Policy incentives for local renewables - Staff training for project management	- Increased installed capacity of local renewables - Integration into municipal energy systems	- Significant emissions reductions (~40% by 2030)	- Enhanced energy security - Local job creation in renewable sector - Community ownership of energy assets
Sustainable Urban Mobility	- Governance & Policy - Social Innovation - Technology / Infrastructure	- Introduction of e-bus routes - Infrastructure for cycling and walking - Public awareness and behavior change initiatives	- Shift towards active mobility - Reduced congestion and traffic intensity	- GHG emissions from transport reduced (~15-25%)	- Improved air quality and health - Increased social cohesion and access
Governance, Data Monitoring & Digital Innovation	- Governance & Policy - Learning & Capabilities - Democracy & Participation	- Establishment of climate and air quality dashboards - Digitalization of city administration	- Transparent monitoring and reporting - Increased public participation in decision-making	- Facilitates targeted emissions reductions - Improved policy effectiveness	- Increased public awareness - Greater social cohesion

		- Citizen engagement platforms			- Higher responsiveness to citizens' needs
Social & Community Innovation	- Social Innovation - Democracy & Participation - Learning & Capabilities	- Launch of citizen science initiatives - Formation of local energy communities - Participatory planning workshops	- More inclusive decision-making - Enhanced community resilience	- Lower community-level emissions, promoting behavioral shifts	- Increased social cohesion and empowerment - Greater acceptance and sustainability of policies
Waste & the Circular Economy	- Technology / Infrastructure - Governance & Policy - Social Innovation	- Introduction of 5 fractions waste management at city level - Organizing circular economy street fares, awareness events - Increase in the reuse of construction materials at city level	- Improved waste recycling rate at city level - Improved construction environment based on reused assets - Improved social cohesion	- Reduced emissions caused by waste - Increase reuse of raw materials and circular economy from waste	- Healthier environment - Increased circular economy actions - Raised awareness among citizens

STRATEGY FOR RESIDUAL EMISSIONS

Describe your approach to managing residual emissions.

Residual Emissions Strategy of the Municipality of Alba Iulia (2024–2033)

1. Strategic Context and Rationale

Alba Iulia's commitment is to reduce greenhouse gas (GHG) emissions, including long-term efforts to reach climate neutrality by 2030. At the same time, an integrated approach is evident, incorporating measures for energy efficiency, sustainable mobility, the circular economy, and green-industrial development.

However, certain emissions—referred to as “residual”—will persist despite the implementation of the most efficient measures, due to technological, economic, or infrastructure-related reasons. These emissions must be managed strategically, as they form an integral part of a comprehensive and responsible sustainability plan.

2. Definition and Characterization of Residual Emissions

“Residual emissions” in the context of Alba Iulia are those emissions that cannot be completely eliminated

due to technological, economic, or legal constraints, such as:

- Emissions from private and public transportation, if a full transition to electric mobility or other clean technologies is not achieved;
- Residual emissions from the construction and renovation of buildings, even after system modernization and energy efficiency upgrades;
- Emissions from industrial processes and waste management that cannot be entirely neutralized by 2030;
- Emissions from the agricultural sector and the use of natural resources in certain activities.

These emissions can be offset or managed to ensure their environmental impact is minimized and that the city meets its sustainability goals.

3. Core Objectives and Principles of the Strategy

- Maximum possible reduction of residual emissions by 2030 through the implementation of innovative technologies and measures;
- Neutralization and compensation of residual emissions to achieve carbon neutrality or net zero;

- Transparency and continuous monitoring to assess efforts and adapt interventions accordingly.

4. Concrete Measures and Interventions for Managing Residual Emissions

4.1. Development of Monitoring and Reporting Infrastructure for Residual Emissions

- **Implementation of an integrated digital platform based on IoT and Big Data to measure and report emissions across all sectors:**

Time perspective: 2026-2030

2026 (Pilot Deployment):

- Platform designed, tested in **municipal buildings**.
- **20% of city emissions monitored in real-time.**
- Data integration rate: **50% automated (IoT-enabled).**

2027 (Full Rollout Phase I):

- Platform extended to transport fleets, large residential retrofits, and industrial sites.
- **≥50% of city emissions covered in real-time.**
- Data automation: **~75% of data streams IoT-enabled.**

- **Creation of a performance indicator set for residual emissions, monitored annually and reportable to the European Commission and local institutions:**

Time perspective: 2026-2030

2026 (Design):

- Draft indicator set aligned with EU MRV standards.
- **Baseline uncertainty: ±20% reduced to ±15%.**
- Indicators adopted by local council, covering buildings, transport, waste, and industrial processes.

2027 (Operationalization):

- Indicators fully integrated into reporting platform.
- Annual reporting to European Commission and national institutions starts.
- Baseline uncertainty further reduced to **±10%.**

4.2. Deployment of Carbon Capture and Storage (CCS) Technologies and Natural Sequestration

- **Pilot projects for carbon capture from industrial processes and heating systems in public and private buildings;**

Time perspective: 2026-2030

2026 (Pilot Launch):

- **1 pilot CCS installation** in a municipal heating plant or small industrial facility.
- Learning outcomes: test capture efficiency, monitoring, and integration with energy systems.

2027–2028 (Scale-up Phase I):

- Extend CCS to **2 additional municipal/industrial sites**.
- Optimization through monitoring and MRV integration.

2029–2030 (Phase II / Consolidation):

- Operationalize CCS in **3–4 key sites**, including private-sector partnerships.
- Demonstrates permanent removal contribution toward municipal residuals.

- **Ecosystem restoration — urban and peri-urban reforestation, as well as green zones for natural carbon sequestration, supported by European funding programs.**

Time perspective: 2026-2030

2026 (Pilot Planting & Planning):

- Plant **urban green areas and peri-urban forests**.

2027–2028 (Expansion Phase I):

- Expand reforested/green zones

2029–2030 (Consolidation & Maturity):

- EU co-financing supports long-term maintenance and monitoring.

4.3. Compensation of Residual Emissions

- **Creation of a local emission compensation fund, financed through public-private partnerships and European funds;**

Time perspective: 2026-2030

2026 (Fund Establishment & Initial Capitalization):

- Fund created via **public-private partnerships (PPP)** and EU grants.
- Target capitalization: **€1–3 million** in first year.

2027–2028 (Scaling Contributions):

- Additional PPP contributions and EU co-financing increase fund capacity.

2029–2030 (Maturity & Full Operationalization):

- Fund fully operational with stable financing mechanisms.
- Ensures residual emissions not mitigated by local measures can be neutralized.

- **Investments in reforestation projects, natural protection zones, and bioenergy projects with carbon sequestration;**

Time perspective: 2026-2030

2026–2027 (Pilot Projects):

- Zones reforested or protected.
- Early bioenergy + sequestration projects implemented at **small scale**.

2028–2030 (Expansion & Integration):

- Increase area under reforestation/protection.
- Bioenergy projects generate additional carbon savings.

- **Partnerships with environmental organizations to develop carbon farming projects in the peri-urban area.**

Time perspective: 2026-2030

2026–2028 (Planning & Pilot Contracts):

- Initial **5–10 peri-urban farms** engaged in carbon farming (cover crops, soil carbon practices).

2029–2030 (Scaling Up):

- Over 10 farms participating by 2030.

4.4. Modernization of the Transport Sector and Sustainable Mobility

- **Continuation and expansion of electric and hybrid mobility systems;**

Time perspective: 2026-2030

2026–2027 (Pilot & Expansion):

- Municipal fleet: 25% replaced by electric/hybrid vehicles.
- Public transport: 50% of buses replaced with electric/hybrid models.

2028–2030 (Scaling up):

- Municipal fleet $\geq 50\%$ electric/hybrid; public transport $\geq 75\%$ electric/hybrid.

- **Medium-term replacement of polluting vehicles with electric, hybrid, and alternative modes (cycling, walking);**

Time perspective: 2026-2030

2026–2027 (Awareness & Pilot Programs):

- Incentives for electric/hybrid private vehicles, promotion of cycling and walking.
- 5% of private cars transition to low-emission or active transport modes.

2028–2030 (Expansion):

- 20–25% of private vehicles replaced by EVs/hybrids; active transport share increased to 15%.

- **Installation of a network of fast and ultra-fast charging stations for electric vehicles;**

Time perspective: 2026-2030

2026–2027 (Initial Infrastructure):

- 3 charging stations already in place, 15 fast charging stations will be installed starting 2026; municipal fleet and early adopters supported.
2028–2030 (Expansion & Full Coverage):
- Network expanded, supporting broader adoption.
- **Measures to discourage hazardous private traffic, such as urban tolling and restricted traffic zones.**
Time perspective: 2026-2030
2026–2027 (Pilot Restricted Zones):
- Limited traffic zones in the city center, targeted congestion charges.
- Reduction in car traffic: ~5–7% of private vehicle emissions.

2028–2030 (Scaling):

- Expanded restricted zones, wider urban tolling, and incentives for public transport.
- Traffic emissions reduced by 15–20%.

4.5. Efficiency and Modernization of Heating and Energy Systems in Buildings

- Transition to heating and hot water using renewable energy technologies, such as heat pumps and integrated photovoltaic systems;
Time perspective 2026-2030
2026–2027 (Pilot Deployment):
- Install heat pumps in **households + 10 public buildings**.
- Rooftop PV systems integrated in ~15% of retrofitted buildings.

2028–2030 (Scaling Up):

- Heat pumps & PV installed in **households + 20 public buildings** by 2030.
- Share of heating from renewables reaches **25% by 2030**.

- Construction and rehabilitation of buildings with high insulation standards to reduce dependence on fossil fuels;

Time perspective: 2026-2030

2026–2027 (Initial Retrofits):

- 50,000 m² residential and 10,000 m² public buildings retrofitted.
- Reduction in heating demand: ~20%.

2028–2030 (Expansion):

- 200,000 m² total residential + 50,000 m² public buildings retrofitted by 2030.
- Heating demand reduced by 35–40%.

- Promotion of energy recovery systems from household and industrial waste.
- Time perspective: 2026-2030

2026–2027 (Pilot Projects):

- Install small-scale waste heat recovery in **1-2 industrial sites + 1 district heating system (local school compound)**.

2028–2030 (Expansion):

- Waste heat recovery in **5–6 industrial facilities**

4.6. Management of Residual Waste

- **Implementation of extensive recycling and composting programs to reduce landfill-bound waste;**

Time perspective: 2026-2030

2025–2026 (Launch & Expansion):

- Introduce city-wide separate collection (plastic, paper, bio-waste).
- Composting facilities handle **~5,000 t organic waste/year**.

2028–2030 (Scale-up):

- Recycling and composting rate reaches **35–50% of municipal waste**.
- **Development of infrastructure for anaerobic digestion of organic waste to produce biogas and fertilizers;**
Time perspective: 2026-2030

2026–2027 (Pilot Facility):

- Anaerobic digestion plant for **organic waste**.
- Energy output replaces fossil fuel equivalent.

2028–2030 (Expansion):

- Capacity expanded.
- Biogas replaces natural gas; digestate replaces synthetic fertilizer.

- **Promotion of zero-waste concepts by encouraging reuse and preventing waste generation.**
Time perspective: 2026-2030

2026–2027 (Awareness & Pilots):

- Community reuse centers and business initiatives reduce **1–3% of total municipal waste**.

2028–2030 (Consolidation):

- Waste prevention and reuse practices expand to **5–10% reduction of waste generation**.

5. Innovative Solutions and Pilot Projects

- **Carbon capture projects in industrial parks and transport zones;**

Time perspective: 2026-2030

2026–2027 (Pilots):

2026–2027 (Pilots):

- **1 pilot CCS unit** in industrial park + capture system for bus depot/transport hub.

2028–2030 (Scaling):

- Expand to **2–3 CCS units** across industrial + transport sites.
- **Development of urban microgrids to optimize consumption and reduce residual emissions;**
Time perspective: 2026-2030
2026–2027 (Design & Pilot):

- 1–2 microgrids (residential district + public facilities).
- Local renewable integration, demand-response systems reduce grid reliance.

2028–2030 (Expansion):

- 4–5 microgrids covering 20% of municipal energy demand.
- **Implementation of renewable energy hubs and “green” technologies across all sectors to minimize residual emissions.**
Time perspective: 2026-2030
2026–2027 (Pilot Hubs):

- 1–2 renewable hubs (solar + storage + EV charging).
- Green tech pilots in construction and waste.

2028–2030 (Expansion):

- 5–6 renewable hubs citywide; industrial green tech adoption.

6. Partnerships and Public Policies

- **Cooperation with the Institute for Research in Circular Economy and Environment “Ernest Lupan” — for logistics, research, and pilot projects;**
Time perspective: 2026-2030
2026–2027 (Initiation & Pilot Research):
- Launch **2–3 pilot projects** on circular economy logistics and emissions tracking.

- Knowledge transfer improves **MRV efficiency and project design**

2028–2030 (Scaling):

- 5–7 joint projects operational (waste-to-energy, CCS optimization, digital monitoring).

- **Integration of residual emissions management objectives into urban and economic development plans;**

Time perspective: 2026-2030

2026–2027 (Policy Embedding):

- Incorporate residual emission objectives into **zoning, construction standards, mobility planning**.

2028–2030 (Full Policy Alignment):

- City development plans fully integrate climate-neutrality pathways.

- **Access to European funds for technological innovation and nature-based solution projects.**

Time perspective: 2026-2030

2026–2027 (Funding Mobilization):

- Secure **€5–7 million** in EU funds for pilots (renewables, CCS, reforestation).

2028–2030 (Expansion of EU-Funded Programs):

- Cumulative funding exceeds **€20 million** by 2030.

- Supports systemic solutions

7. Continuous Improvement and Adaptation

- **Annual reassessment of the residual emissions management and compensation system;**

Time perspective: 2026-2030

2026–2027 (Establishment):

- Set up annual review cycle of MRV, offsets, and compensation fund.
- Early corrective actions cut **tCO₂ emissions** by addressing inefficiencies.

2028–2030 (Operational Scaling):

- Full annual review system in place, with sectoral benchmarks and corrective plans.

- **Certification of progress through environmental audits and sustainability indicators;**
Time perspective: 2026-2030

2026–2027 (Implementation):

- Introduce certification and third-party audit for municipal projects.
- Transparency improves performance

2028–2030 (Consolidation):

- Audits extended to private-sector partners and EU-funded programs.
- By 2030, contributes to **tCO₂** reduction in avoided residuals through accountability pressure.

- **Policy adaptation to emerging technologies, European trends, and monitoring results.**
Time perspective: 2026-2030

2026–2027 (Framework Setup):

- Align policies with Fit-for-55, EU Taxonomy, and Horizon Europe pilot innovations.

2028–2030 (Dynamic Adjustment):

- Integrate breakthroughs (advanced CCS, hydrogen mobility, smart grids).

INDICATORS FOR MONITORING, EVALUATION AND LEARNING

PORTOFOLIO OF INDICATORS

Table 13 Portfolio of indicators

ACTION	OUTCOME / IMPACT ADDRESSED	INDICATOR TITLE	INDICATOR CODE	TARGET VALUES		
				2027	2030	2035
Renewable Energy Deployment	Reduce carbon emissions in buildings, increase renewable energy share	Share of renewable energy in total energy consumption of buildings	RE-01	10%	25%	85%
Energy Efficiency in Public Buildings	Minimize energy consumption, enhance sustainability	% of public buildings upgraded for energy efficiency	EE-PB-02	10%	60%	90%
Electrification of Transport	Reduce emissions from urban transport	Number of electric vehicles registered	EV-03	1000	1500	3000
Smart Grid and Utilities	Improve energy distribution efficiency	% of public lighting integrated into IoT	SG-04	3%	50%	100%
Waste Management and Recycling	Increase recyclables, reduce landfill waste	% of municipal waste recycled	WM-05	8%	50%	85%
Public Participation and Awareness	Enhance citizen engagement	Number of citizens engaged in sustainability programs	PA-06	500	3000	50000

Local Energy Production Capacity	Achieve energy independence	MW installed capacity from local renewable sources	LP-07	5 MW	25 MW	35 MW
Increase in Urban Green Space Area	Increase quality of life	sqm/capita	green space sqm/capita	0	26 sqm/capita	30 sqm/capita

For every proposed indicator, fill out one Metadata Indicator sheet, by using the template provided below.

INDICATOR METADATA

INDICATOR NAME	Share of renewable energy in total energy consumption of buildings and public lightning
INDICATOR UNIT	Percentage (%)
DEFINITION	The proportion of energy consumed within the city that is derived from renewable sources such as solar, wind, or biomass.
CALCULATION	$(\text{Amount of energy from renewable sources} / \text{Total energy consumption}) \times 100\%$
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Energy generation, residential, commercial, public services
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Reduction in air pollutants, energy independence, local employment
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Mitigation of climate change
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes
EXPECTED DATA SOURCE	Municipal energy utility reports, renewable energy project data, energy consumption records
EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Annual percentage reports, dashboards
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	U4SSC, CDP Climate Change questionnaire

INDICATOR NAME	Percentage of public buildings upgraded for energy efficiency
INDICATOR UNIT	Percentage (%)
DEFINITION	The proportion of publicly owned buildings that have completed energy efficiency upgrades such as insulation, lighting, or HVAC improvements.
CALCULATION	$(\text{Number of upgraded public buildings} / \text{Total public buildings}) \times 100\%$
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Buildings, energy use
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Reduced energy costs, improved indoor air quality, enhanced resilience
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Energy efficiency and decarbonization
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes
EXPECTED DATA SOURCE	Municipal building records, audit reports
EXPECTED AVAILABILITY	Biannually
SUGGESTED COLLECTION INTERVAL	Every 2 years
DELIVERABLES DESCRIBING THE INDICATOR	Progress reports, dashboards
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	ISO 50001, Global Covenant of Mayors

INDICATOR NAME	Number of electric vehicles registered
INDICATOR UNIT	Count (number)
DEFINITION	The total number of electric vehicles (EVs), including private, public, and commercial, registered within the city

CALCULATION	Sum of all EV registrations per year
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Transport
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Air quality improvement, noise reduction, technological innovation
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Mitigation of GHG emissions from transport
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes
EXPECTED DATA SOURCE	Vehicle registration database, transport department data
EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Annual registries, trend analysis reports
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	EUROPEAN Alternative Fuels Observatory (EAFO), City Mobility Reports

INDICATOR NAME	Percentage of municipal public lighting integrated into IoT
INDICATOR UNIT	Percentage (%)
DEFINITION	The proportion of the city's street lighting infrastructure that is managed and monitored via IoT technology.
CALCULATION	$(\text{Number of IoT-enabled streetlights} / \text{Total streetlights}) \times 100\%$
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN	Yes

GREENHOUSE GAS EMISSIONS?)	
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Buildings, transport (related to reduced nighttime energy consumption)
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Energy savings, improved public safety
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Energy efficiency
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes
EXPECTED DATA SOURCE	City's IoT management platform, infrastructure audits
EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Annual integration status reports
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	U4SSC, Smart City Platform dashboards

INDICATOR NAME	Reduction in GHG emissions from photovoltaic (PV) systems
INDICATOR UNIT	Tons of CO ₂ equivalent (tCO ₂ e)
DEFINITION	The amount of greenhouse gases (GHGs) emissions avoided due to the operation of PV systems, calculated based on energy generated and the emission factor of the grid.
CALCULATION	Energy generated by PV (kWh) × emission factor (tCO ₂ e/kWh)
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Energy generation, buildings, transport (if connected to electric mobility)

DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-	Yes
--	-----

BENEFITS)?	
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Air quality improvement, energy security
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Mitigation
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes
EXPECTED DATA SOURCE	PV system energy output data, emission factors from national/environmental authorities
EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Annual emission reduction reports, calculation models
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	UNFCCC GHG Inventory, EU Monitoring and Verification Reports

INDICATOR NAME	Percentage of municipal solid waste recycled
INDICATOR UNIT	Percentage (%)
DEFINITION	The proportion of collected municipal solid waste that has been processed through recycling.
CALCULATION	$(\text{Weight of recycled waste} / \text{Total municipal waste collected}) \times 100\%$
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Waste management
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes

IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Reduction of landfill use, lower methane emissions, resource conservation
CAN THE INDICATOR BE USED FOR	Yes

MONITORING IMPACT PATHWAYS?	
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Circular economy, climate change mitigation
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes
EXPECTED DATA SOURCE	Waste management reports, recycling facility data
EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Annual recycling percentage reports
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	Eurostat waste statistics, Circular Economy Dashboards

INDICATOR NAME	Percentage of urban population served by wastewater collection systems
INDICATOR UNIT	Percentage (%)
DEFINITION	The proportion of the urban population connected to formal wastewater collection and treatment infrastructure.
CALCULATION	$(\text{Population served by wastewater systems} / \text{Total urban population}) \times 100\%$
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Water and wastewater management
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Reduced waterborne disease risk, nutrient load reduction in water bodies
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes

IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Climate resilience, water security
IS THE INDICATOR CAPTURED BY	Yes

THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	
EXPECTED DATA SOURCE	Municipal water utility reports, censuses
EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Annual coverage reports
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	UN Water SDG indicators, Global Water Intelligence

INDICATOR NAME	Degree of digitalization of public administration
INDICATOR UNIT	Percentage (%)
DEFINITION	The extent to which public services and administrative processes are digitized, such as online services, e-governance platforms, and digital workflows.
CALCULATION	$(\text{Quantitative measure of digitalized services} / \text{Total applicable services}) \times 100\%$
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Indirect impact via efficiency, reduced paper use, and travel
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Operational efficiency, transparency, citizen engagement
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Digital transformation, efficiency of governance
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes

EXPECTED DATA SOURCE	Municipal IT department reports, ser
EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Digitalization progress reports
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	Council Digital Maturity frameworks, DESI (Digital Economy and Society Index)
INDICATOR NAME	Increase in Urban Green Space Area
INDICATOR UNIT	Square meters (m ²) / capita
DEFINITION	The total surface area of newly created or revitalized urban green spaces (parks, gardens, green roofs, etc.) within the city boundaries and metropolitan area.
CALCULATION	$(\text{New green space area} - \text{Previous green space area}) / \text{Total urban area} \times 100$
DOES THE INDICATOR MEASURE DIRECT IMPACTS (I.E. REDUCTION IN GREENHOUSE GAS EMISSIONS?)	Yes
IF YES, WHICH EMISSION SOURCE SECTORS DOES IT IMPACT?	Indirectly affects emissions from buildings and transport by improving microclimate and encouraging walking/cycling.
DOES THE INDICATOR MEASURE INDIRECT IMPACTS (I.E. CO-BENEFITS)?	Yes
IF YES, WHICH CO-BENEFIT DOES IT MEASURE?	Biodiversity, mental and physical health, social cohesion, urban cooling
CAN THE INDICATOR BE USED FOR MONITORING IMPACT PATHWAYS?	Yes
IF YES, WHICH NZC IMPACT PATHWAY IS IT RELEVANT FOR?	Adaptation and mitigation
IS THE INDICATOR CAPTURED BY THE EXISTING CDP/ SCIS/ COVENANT OF MAYORS PLATFORMS?	Yes
EXPECTED DATA SOURCE	GIS mapping of green spaces, municipal planning records

EXPECTED AVAILABILITY	Annually
SUGGESTED COLLECTION INTERVAL	Yearly
DELIVERABLES DESCRIBING THE INDICATOR	Urban development reports, spatial analysis datasets
OTHER INDICATOR SYSTEMS USING THIS INDICATOR	UN SDG 11.7.1, Urban Atlas (EEA), WHO Urban Green Space Indicators

STAKEHOLDERS

Provide a concise overview of the key stakeholders who hold significant influence or impact on the local transition to climate neutrality.

- **Make sure to also address the internal and external stakeholders that are relevant to the climate neutrality transition in terms of the necessary financing. For these stakeholders, address the funding issues both in the influence and interest columns, where applicable.**

(insert here: text + if necessary, relevant visuals - pictures, figures, charts)

To achieve carbon neutrality objectives, Alba Iulia must facilitate strategic collaboration between internal stakeholders, such as local authorities, citizens, the private sector, and research institutions, and external stakeholders, including the national government, the EU, international organizations, and funding partners. Each of these groups has a significant influence in accessing funding, implementing innovative technologies, and adopting sustainable policies. This coordinated effort is essential to ensure the necessary financial support, legislative backing, and dialogue needed to implement projects aimed at reducing emissions and adapting to climate change.

STAKEHOLDERS ANALYSIS

Table 14 Stakeholders analysis

STAKEHOLDER	SYSTEM	NETWORK	INFLUENCE	INTEREST	ENGAGEMENT
Local authorities (City Hall of Alba Iulia and other local public institutions)	Urban planning, energy, environment, and transportation departments	Multidisciplinary teams, local advisory councils	Very high – initiates, approves, and funds strategic projects	Very high – responsible for implementing sustainable development and energy efficiency plans	Active participation in strategy development and monitoring, public consultations, project management meetings
Citizens and local communities	Civil society, public service users	Dialogue groups, citizen forums	Medium – influences public opinion and acceptance of changes	Very high – directly affected by projects, infrastructure, and environmental changes	Engagement through public consultations, feedback sessions, awareness campaigns
Private sector	Technology companies, renewable energy firms, sustainable construction	Business clusters, industry associations	High – participates in deploying smart city and energy solutions	High – motivated by innovation opportunities, economic growth, and profit	Public-private partnerships, tenders, pilot projects for innovative solutions
Research institutions and universities	Alba Iulia University, research institutes	R&D related to urbanism, energy, and environment	Medium – contributes with studies, data, and technology	Medium – interested in research activities and innovation	Collaborative research projects, stakeholder consultations for strategy development
Financial and investment organizations	Banks, European funds, green bond issuers	Funding networks, financial partnerships	High – finances sustainable projects	High – seeking sustainable investment opportunities	Accessing funds, co-financing, green financing schemes
National and European authorities	Ministries, Environmental Agencies, European Union	Inter-institutional cooperation networks	Very high – defining legal and financial frameworks	High – supporting emission reduction and digitalization objectives	Legislative development, grants, and funding from national and EU sources

NGO and civil society organizations	Environmental NGOs, advocacy groups	Community networks, national/international partnerships	Medium – mobilizes and raises community awareness	Very high – promotes sustainability and social inclusion	Campaigns, awareness events, community consultations
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Shortly describe the participatory model for achieving climate neutrality, highlighting the collaboration with the local community (citizens), local stakeholders (e.g., private companies, NGOs, research organisations) and external partners (e.g., other public administrations, regional development agencies, national ministries, other organisations).

- Relevant aspects may include the local context, the prior experience in community and stakeholder collaboration (e.g., jointly developed and implemented projects, strategic partnerships) and the engagement with various external partners.
- Present the participatory measures used in developing this Action Plan (if applicable) and the participatory method (approaches, processes, mechanisms, instruments, structures, capacity building) to be employed in order to ensure both the implementation and monitoring of the current Climate Neutrality Action Plan.
- Make sure to also describe the actions pertaining to Organisational and Governance Innovation, as well as the actions related to Social and Other Innovation fields.
- Do not forget to make reference to upholding the principles of climate justice, particularly for the marginalised communities.

Participatory Model for Achieving Climate Neutrality in Alba Iulia

1. Context and Foundation of the Participatory Approach

Alba Iulia has cultivated a robust tradition of multi-stakeholder collaboration, rooted in a long-standing experience of joint development projects, strategic partnerships, and community engagement initiatives. The city's past success in implementing pilot projects such as smart mobility, renewable energy integration, and public participation forums demonstrates its capacity to foster inclusive governance models,. These collective efforts build trust, ensure local relevance, and promote shared ownership of sustainability and climate goals.

Alba Iulia was active as a partner in more than 8 URBACT networks so far starting with 2019 it became the first city in Romania as Lead Partner in an Action Planning Network - "Find Your Greatness"<https://urbact.eu/find-your-greatness>

During the URBACT experience Alba Iulia Municipality addressed the food waste issue and local production stimulation in 2 different projects: Food Corridors (2022), and Gastronomic Cities (2013). URBACT offers a great opportunity for knowledge and expertise sharing. Relevant study on local production and climate change:

https://www.apulum.ro/images/uploads/Studiu_Barabant_Vers_Finala_18012024.pdf

Alba Iulia was also labeled by URBACT as a good practice in City Branding - being the first city in Romania to adopt city branding strategy. Of course a good communication can not be done without



taking into consideration the sustainable development principles:

<https://urbact.eu/good-practices/city-branding-making-invisible-visible>

Using URBACT, Interreg Europe mechanisms to involve local stakeholders it helped our city develop skills and methods to approach different stakeholders in the development strategy. Also for the current CCC Alba Iulia organized 6 local stakeholders meeting (within the design process of the Green City Action Plan financed by EBRD)

2. Engagement with Local Communities and Citizens

Alba Iulia emphasizes participatory mechanisms that actively involve its citizens, including vulnerable and marginalized communities, ensuring their voices influence the design and implementation of climate policies. Public consultations, participatory budgeting, and citizens' workshops serve as core instruments that facilitate dialogue and empower residents to participate in decision-making processes. Digital engagement platforms, such as IoT-based citizen feedback systems and online forums, are employed to widen inclusion, especially for youth, elderly, and disadvantaged groups, fostering climate justice and social equity.

3. Partnerships with Local Stakeholders and Civil Society

The city's strategy emphasizes collaboration with local private sector actors—such as SMEs, private transport operators, and energy service companies—which are crucial for deploying smart solutions like electric mobility and energy efficiency measures. Engagement with NGOs and civic organizations ensures that social dimension into project planning. Alba Iulia actively promotes stakeholder platforms where businesses, research entities, NGOs, and community representatives co-develop innovative projects—such as climate risk assessments, green jobs initiatives, and awareness campaigns—thus reinforcing participatory governance.

4. External Partnerships and Multilevel Collaboration

Alba Iulia recognizes the importance of external cooperation to leverage resources, expertise, and policy support. The city has established strategic partnerships with regional development agencies, national ministries, EU programs (e.g., Digital Europe, Horizon Europe, Interreg Europe, URBACT), and international research institutions (Coventry University, CityxChange, INTERPED project). These collaborations facilitate technology transfer, funding access, and policy alignment, ensuring that local actions are embedded within broader regional and national climate strategies. Alba Iulia is the first city in Romania to have an official partnership with the World Bank, contracted the expertise from the WB to create the strategy of development of the city, the main instrument for attracting ERDF funds. In 2015, according to the WB Alba Iulia ranked first in Romanian cities per capita in attracting EU funding, and in 2024, according to the Institute for Visionaries Cities Alba Iulia ranked 9th in the county capitals of Romania for city performance in general. Also, Alba Iulia was the first



city in Romania to request and obtain a rating from one of the top 3 Rating Companies in the world (Moody's).

In addition, Alba Iulia is part of different Transnational Associations/ organizations: ICLEI, TRANSROMANICA- Romanesque Heritage Cultural Route of the Council of Europe, Roman Emperors Cultural Route of the Council of Europe, Climate Alliance, Green City Accord, Covenant of Mayors for Climate and Energy, etc.

5. Participatory Measures and Processes

- **Stakeholder Forums and Advisory Councils:** Regular meetings involving local government representatives, citizen groups, business leaders, and NGOs provide platforms for discussing progress, challenges, and stakeholder inputs.
- **Workshops and Co-Creation Sessions:** These gather diverse expertise for planning, prioritizing, and evaluating climate interventions, ensuring inclusivity and social justice.
- **Digital Participatory Tools:** Interactive websites, IoT-enabled feedback systems, and social media channels are used to facilitate ongoing engagement, particularly targeting youth and marginalized groups.

- **Capacity Building Programs:** Workshops and training to enhance local stakeholder knowledge on climate issues, innovative technologies, and governance practices support the effective participation of community members and organizations.

6. Governance and organizational innovation

To ensure effective implementation and monitoring, Alba Iulia has established specialized governance structures:

- **Dedicated Urban Sustainability and Climate Units:** These units coordinate participatory activities, monitor progress, and facilitate cross-sectoral integration.
- **Multi-Stakeholder Committees:** Inclusive committees bring together public authorities, private sector, academia, civil society, and community representatives to oversee climate initiatives.
- **Legal and Policy Frameworks:** Regulations and policies promote transparency, participation rights, and social inclusion, embedding participatory principles within formal governance processes.

7. Social and Other Innovations

- **Social Innovation:** Alba Iulia's initiatives include social inclusion schemes like preferential access to renewable energy benefits, community-led renewable installations, and training programs for vulnerable populations, ensuring equitable benefits.
- **Economic Innovation:** Promotion of green startups, local green jobs, and circular economy initiatives creates economic opportunities for marginalized groups while advancing climate objectives.
- **Technological Innovation:** Deployment of smart grids, IoT systems for energy and environment monitoring, and AI-driven data analytics enable participatory monitoring and adaptive management of climate actions, ensuring accountability and transparency.

8. Upholding Climate Justice Principles

Throughout these processes, Alba Iulia pays special attention to climate justice. Targeted engagement is directed at marginalized populations—such as low-income and vulnerable groups—to ensure they benefit from climate initiatives and are protected from potential adverse effects, like energy poverty or social exclusion. Policies are designed to promote equitable access to clean energy, participation opportunities, and benefits, aligning with European standards and local principles of social fairness.

BARRIERS

Provide a summary of the main local barriers impeding the city's transition towards climate neutrality.

- **For each barrier, briefly outline its impact on hindering the climate neutrality achievement and describe the approach / intervention / solution for overcoming it through the implementation of the current Climate Neutrality Action Plan.**
- **Make sure to also incorporate barriers related to climate investment: structural, policy, economic and financial obstacles which could hinder the deployment of capital to support climate action.**

The main local barriers impeding Alba Iulia's transition to climate neutrality include inadequate technological availability and expertise, fragmented responsibilities across sectors, bureaucratic red tape, limited digitalization, and insufficient citizen engagement, which collectively slow down policy implementation and innovation; alongside structural, policy, economic, and financial obstacles such as access to funding, high investment costs, lack of supportive regulatory frameworks, and limited access to green financing instruments like municipal bonds and PPPs, all of which hinder the deployment of necessary capital. The city's current Climate Neutrality Action Plan aims to tackle these challenges through targeted interventions including strengthening multi-stakeholder collaboration, streamlining administrative procedures, enhancing digital tools for monitoring and citizen participation, expanding access to innovative financing schemes, and fostering public-private partnerships to mobilize investments, thereby accelerating progress towards a sustainable and resilient climate-neutral Alba Iulia.

KEY BARRIERS

Table 15 Key barriers

EMISSION DOMAIN	IDENTIFIED BARRIER	DESCRIPTION	PROPOSED SOLUTION
Energy Production & Consumption	Lack of available technologies for emissions reduction	Certain sectors, such as industry and transportation, face technological gaps that hinder the adoption of effective emission mitigation measures, especially in areas requiring advanced low- carbon solutions.	Promote R&D, facilitate access to innovative low- carbon technologies through European funding, and foster partnerships with tech providers to accelerate deployment.
Transport	Limited infrastructure for low-emission mobility	Insufficient electric vehicle charging infrastructure and public transport upgrades delay the shift to cleaner mobility options, contributing to higher emissions	Invest in EV charging networks, expand green public transport, and implement incentive schemes for sustainable mobility
Buildings & Industry	Fragmentation of responsibility among stakeholders	Multiple entities oversee building renovations or industrial emissions, leading to delays and inefficiencies in implementing mitigation measures.	Establish clear governance, create multi-stakeholder coordination platforms, and streamline decision-making processes.
Waste & Wastewater	Waste water, Insufficient waste management practices	Emissions from waste and wastewater are under-optimized, with limited recycling and methane capture opportunities.	Improve waste management infrastructure, promote circular economy practices, and implement methane capture systems.
Citizen & Community Engagement	Insufficient citizen awareness and participation	Citizens lack understanding or motivation for emission reduction behaviors, limiting community-driven initiatives.	Launch awareness campaigns, participatory planning, and educational programs to enhance community involvement.
Financial & Regulatory Barriers	Lack of accessible funding/finance schemes and regulatory instability	Limited financial instruments and uncertain policies hinder project investments in emission reduction initiatives.	Develop dedicated green financing, leverage EU funds, and advocate for stable policies aligned with EU directives.
Climatic Limitations	Climatic conditions affecting renewable deployment	Extreme weather and climatic variability impact renewable energy efficiency and infrastructure resilience.	Incorporate climate-resilient designs, diversify renewable energy sources, and implement adaptation measures.

RISKS

Provide a short summary of the main risks which may affect the achievement of the city's climate- neutrality goals by 2035.

- For each risk, briefly outline its impact on hindering the climate neutrality achievement and describe the approach / intervention / solution for overcoming it through the implementation of the current Climate Neutrality Action Plan.**
- Make sure to also incorporate the risks related to the financing of the climate investments.**

In the context of Alba Iulia's strategic goal to achieve climate neutrality by 2035, identifying and managing key risks is crucial for the success of this transition. The analysis of the documents and action plans developed within the M100 program highlights a series of risks and challenges that could negatively impact the achievement of climate commitments. These include, among others, technological and infrastructure risks, legislative and administrative barriers, as well as obstacles related to financing and access to adequate financial resources.

Each risk has the potential to delay or weaken emission reduction efforts and compromise the sustainability of the transition to a low-carbon economy. Therefore, it is essential to identify the impact of each risk and develop targeted interventions and solutions, integrated into the Climate Neutrality Action Plan, to minimize these risks.

Furthermore, difficulties in securing adequate funding represent a significant risk factor, as the investments required for infrastructure modernization, technological upgrades, and project implementation are substantial and involve considerable financial resources. Addressing these risks involves facilitating access to European funds, mobilizing private investments, and developing a conducive framework for sustainable financing.

This analysis will provide a clear perspective on the main risks, their impact on the climate transition process, and the measures Alba Iulia will implement to effectively manage them and ensure the achievement of the climate neutrality target by 2035.

MAIN RISKS

Table 16 Main risk

FIELD OF ACTION	IDENTIFIED RISK	RISK DESCRIPTION	MITIGATION SOLUTION
Energy Systems	Technological obsolescence	Rapid advancements in energy tech may render current infrastructure outdated, risking stranded investments.	Regular technological assessments, fostering innovative pilot projects, and phased upgrades to remain adaptable. Introduce a 5-year technology review cycle, allocate min. 5% of investment budget to pilot innovative projects based on partnerships with private energy tech providers and Utility companies to ensure adaptability.
Built Environment	Insufficient building renovation capacity	Limited workforce and expertise hindered large-scale retrofitting, delaying emission reduction targets.	Capacity-building programs, partnerships with technical institutions, and incentives for skilled workforce development. Also, partnering with resident Associations of flats.
Mobility & Transport	Lack of integrated mobility solutions	Fragmented transport policies may reduce modal shift effectiveness, impeding decarbonization.	Develop integrated mobility plans, promote multimodal solutions, and use smart traffic management systems. Enhance the interoperability between existing systems, use the traffic management center which was recently implemented, based on smart city solutions in terms of mobility.
Waste & Circular Economy	Limited recycling infrastructure	Gaps in waste sorting and recycling facilities lead to increased landfill waste and higher emissions.	Invest in advanced recycling facilities- ongoing projects for eco Islands for waste recycling, public awareness campaigns also in schools, and incentivize waste separation.
Green Infrastructure & Nature-based Solutions	Urban heat island effect	Insufficient green spaces exacerbates heat risks, impacting health and local climate resilience.	Expand green corridors, implement urban greening projects, and promote community- led green initiatives. Already ongoing projects for extending the parks and implementing Urban Forests in the city.

Funding & Financing	Limited access to sustainable funding	Relying on uncertain EU and national funds poses financial risks; insufficient private sector investment.	Develop blended financing models, establish local green bonds, and strengthen EU funding applications. Getting more active in the planning process for the new financial mechanisms framework for Romania.
Transversal / Cross-sector	Lack of stakeholder coordination	Fragmented governance structures hinder strategic alignment and effective action implementation.	Create multi-stakeholder governance platforms, improve coordination mechanisms, and transparent communication channels. Continue the collaboration created for the 6 Local Green deals signed in the field of energy, mobility and tourism.
Social Innovation	InnovationResistance to behavioral change	Social acceptance of new technologies and sustainable practices may be low, slowing adoption.	Design inclusive awareness campaigns, participatory projects, and community engagement programs. Using the Multifunctional Center created in the most vulnerable area of the city, for the vulnerable community. The place is a generous infrastructure for and multitude of experts in the social field who will be actively involved. Also, use the internal platform of Alba Iulia Municipality for participatory budgeting to use the dedicated funding available for climate neutrality.
Governance Innovation	Policy and regulatory delays	Slow legislative processes and bureaucratic barriers delay project approval and implementation.	Dedicate a formal municipal rapid response team for climate projects. Ensure the adaptation of local projects into the county /regional/national strategic framework. Adopt periodic communication with local actors impacted by the CCC or the ones who can contribute to the CCC implementation. Ensuring the political support for continuing the projects and ambitions. Alba Iulia's success is recognised as a strength in ensuring political stability and as a model for continuity.

Community Engagement	Prioritization of other investments over climate measures	Other infrastructure projects (roads, utilities) may overshadow climate adaptation	Ensure period communication with the local community to explain the benefits of the projects. Embed climate co-benefits into all major infrastructure projects; require climate impact assessments for 100% of new investments;
Funding Equity	Less funding for small and medium-sized cities, bigger cities and regional development poles being prioritised.	National/EU programs often prioritize larger metropolitan areas, leaving mid-sized cities underfunded.	Working closely with the National Association of Municipalities, with other Medium sized cities, lobbying for dedicated funding for medium sized cities. Centralized feedback sent by Alba Iulia Municipality together with other interested municipalities to suggest amends allowing eligibility also to cities under 100 000 inhabitants for example, taking into consideration the population not only for the urban center but also with localities included at metropolitan level

OPPORTUNITIES

Outline the main opportunities you aim to leverage in order to accelerate the local transition towards climate neutrality.

The main opportunities Alba Iulia aims to leverage to accelerate its transition towards climate neutrality include:

1. **European Funding and Financial Instruments:** Access to EU grants, subsidies, and cohesion funds dedicated to sustainable development and energy transition, enabling large-scale investments in renewable energy, energy efficiency, and green infrastructure.
2. **Smart City Technologies and Digitalization:** Implementing innovative digital solutions for urban management, energy monitoring, and citizen engagement to optimize resource use, improve service delivery, and foster participatory policy-making, speeding up climate action.
3. **Public-Private Partnerships (PPPs):** Engaging private sector investors, technology providers, and local stakeholders to co-develop sustainable projects, share risks, and mobilize necessary capital for infrastructure upgrades and innovative initiatives.
4. **Community Engagement and Citizen Participation:** Increasing awareness and involvement of citizens through education, behavioral change campaigns, and inclusive decision-making, ensuring social acceptance and support for climate policies.
5. **Natural and Green Infrastructure:** Utilizing nature-based solutions, urban green spaces, and ecological corridors to enhance climate resilience, improve air quality, and provide ecosystem services, aligning environmental and social benefits.
6. **Existing National and Regional Initiatives:** Building on ongoing projects and policies such as national climate programs, regional green energy strategies, and initiatives like the Living-in.eu Movement and City Science, to create synergies and accelerate impact.
7. **Technological Innovation and R&D:** Capitalizing on emerging technologies in renewable energy, storage, and smart grids, as well as pilot projects, to demonstrate viability, reduce costs, and scale successful solutions.
8. **Urban Regeneration and Sustainable Land Use Planning:** Leveraging urban renewal projects to implement energy-efficient buildings, promote active mobility, and reduce urban sprawl, creating



compact and sustainable urban environments.

These opportunities provide a strategic pathway for Alba Iulia to accelerate its climate neutrality agenda, fostering a resilient, innovative, and inclusive transition process.

ASSISTANCE NEEDS

Provide a brief overview of the key areas or aspects where external support would be required, in order to overcome the local barriers, mitigate the external risks and capitalise on the available opportunities, such as to achieve climate neutrality.

- Take into account the gaps that need to be fulfilled (eg., financing, data collection, monitoring and assessment, knowledge deficiencies, governance, citizen engagement, stakeholder collaboration, innovative approaches etc.).

Alba Iulia requires targeted external support to effectively overcome local barriers and unlock opportunities for climate neutrality. Key support areas include:

1. **Funding and Financing:** Access to innovative financing instruments such as green bonds, EU grants, and concessional loans to bridge the funding gap, especially for large infrastructure and renewable energy projects. (Experience in attracting more than 350.000.000 euros, with a dedicated experience team involved at municipality level)
2. **Technical and Knowledge Transfer:** Expert guidance on best practices, innovative technologies, and capacity-building to address skills shortages, enhance technical expertise, and build local institutional capacity. (Alba Iulia was awarded by URBACT to be a good practice in city marketing)
3. **Data Collection, Monitoring, and Assessment:** Support in establishing comprehensive data management systems, real-time monitoring tools, and standardized procedures for tracking emission reductions and evaluating policies' effectiveness. (Anergo observatory is a good practice example at national level developed by ALEA in collaboration with municipalities)
4. **Policy and Governance Frameworks:** Assistance in streamlining regulatory and bureaucratic processes, developing clear strategic frameworks, and adopting innovative governance models to facilitate faster decision-making and project implementation. (Alba Iulia is open for replication of good practices at national and international level)
5. **Stakeholder and Citizen Engagement:** Expertise in designing participatory processes, awareness campaigns, and educational initiatives to foster social acceptance, behavioral change, and active citizen involvement. (Alba Iulia has great experience in stakeholder and citizen engagement, using URBACT and Interreg Europe methods for involving local stakeholders but also experienced in using local tools developed such as Local Barometer or

Participatory Budgeting). As well an efficient tool for reporting incidents on the urban development map of the city - citizens can use the SMART Alert. Alba Iulia platform, highlighting the resolution of the incident on the map and the person responsible at city level.

6. **Innovative Approaches and Pilot Projects:** Support for piloting new solutions, demonstrating scalability, and integrating advanced digital and ecological innovations that can be adapted locally. The Smart city pilot project remains a good practice example at national and international level, for the implementation of 100 smart city solutions with the involvement of the private sector, with the occasion of celebrating 100 years of Unification of Romania, signed in 1918 in Alba Iulia.
7. **Partnerships and Networks:** Facilitation of international and regional cooperation through knowledge-sharing platforms, joint projects, and peer-learning networks to benefit from global expertise and experiences. Alba Iulia was selected both as city under review in 2025 by EUI - hosting more than 50 European officials from EU countries, to enhance their local strategies. Also, Alba Iulia participated in Peer reviews organized by EUI as peer reviewer for other cities (Coimbra, Valea Jiului and soon in Sweden for a Estonian region (Saku Region - Tallin). In addition, Alba Iulia was selected to be expert peer review also under the Interreg Europe Program for Genova, Italy.
8. **Research and Development:** Funding and guidance for R&D activities focused on emerging technologies, alternative energy sources, and urban resilience measures tailored to Alba Iulia's specific context. Alba Iulia implemented and has under implementation different projects under the RD

Addressing these support areas will enhance Alba Iulia's capacity to implement effective climate policies, reduce risks, and leverage opportunities to achieve its climate neutrality target.

III. INVESTMENT PLAN



EXISTING FUNDING AND FINANCING

Outline, analyse and evaluate the past and current funding and financing allocated to climate-related initiatives across each field of action.

Alba Iulia has demonstrated a proactive approach to climate-related funding and financing, leveraging a diverse portfolio of sources for its sustainability initiatives:

Past Funding and Financing:

- The city has successfully accessed over €350 million in non-reimbursable EU funding through projects under the ERDF Regional Operational Program, approx. 80% primarily aimed at transforming mobility, upgrading public lighting, and enhancing energy efficiency.

- Initiatives such as retrofitting public lighting with LED technology and installing smart lighting systems have been financed through EU grants, contributing to significant emission reductions and energy savings. (As of now almost 90% of the lightning system in Alba Iulia is intelligent and efficient (led based solutions and telemanagement).
- The municipality's involvement in research and innovation projects, including partnerships with academia and private sector actors, has also attracted funding, notably the €26 million EU-funded dual education campus project focusing on sustainable development and green buildings.

Current Funding and Financing:1 bill

- The municipality estimates a total capital requirement of approximately €1 billion to realize its climate neutrality objectives, with: Own funds 12%, Regional, national, EU funds and financing: 77%, Private financing: 8%, Other 3%
- Alba Iulia has begun exploring innovative financing instruments such as green municipal bonds, though challenges remain in their implementation at the local level.
- The city has also initiated partnerships aimed at accessing private capital, including pilot projects with private companies, and is considering mechanisms like public-private partnerships and investor community development to mobilize additional resources.

Evaluation:

- While the city has achieved considerable success in attracting external funding, especially from EU sources, reliance on these grants poses sustainability risks, necessitating diversification into other financing mechanisms, such as green bonds, PPPs, and private investments.
- The limited experience with green municipal bonds and complex financial instruments indicates an opportunity to strengthen capacity in financial structuring and market engagement.
- The existing funding landscape has been effective for project-level interventions; however, a comprehensive, coordinated investment strategy aligned with long-term climate goals is needed to ensure all sectors are adequately financed and aligned toward net-zero objectives. Overall, Alba Iulia's prior investments have laid a solid foundation for its climate action, but the scaling and integration of funding sources remain crucial to achieving climate neutrality by 2035.

FUNDING ALLOCATION BY FIELD OF ACTION

The capital flow table needs to also incorporate capital stock.

Table 17 The capital flow

FIELDS OF ACTION	SECTOR SUBSECTION	% CURRENT BUDGET ALLOCATION
TRANSPORTATION	<i>Electrification of Transport</i>	18 – 22%
BUILT ENVIRONMENT	<i>Local Energy Production Capacity</i>	10 – 15%
ENERGY SYSTEMS	<i>Renewable Energy Deployment</i>	20 – 25%
	<i>Energy Efficiency in Public Buildings</i>	10 – 12%
	<i>Smart Grid and Utilities</i>	5 – 8%
GREEN INFRASTRUCTURE AND NATURE BASED SOLUTIONS	<i>Urban Forestry & Nature-Based Solutions</i>	3 – 8%
WASTE AND CIRCULAR ECONOMY	<i>Waste Management and Recycling</i>	5 – 7%
SOFT INTERVENTIONS (GOVERNANCE AND SOCIAL INNOVATION)	<i>Public Participation and Awareness</i>	1 – 2%

STRATEGIC FUNDING AND FINANCING

Assess the city's current financial policies, in order to illustrate how the public administration is allocating capital towards becoming climate neutral.

- **This evaluation should encompass the existing strategies and resources available to the city to facilitate the transition.**
- **Identify the various forms of capital available for the city, particularly those specific to local climate neutrality targets.**

Analyzing the city's financial policy and available resources, it is evident that a strategic approach is being taken to allocate capital toward achieving climate neutrality, in accordance with the documents and strategic plans in folder M100. The Alba Iulia 2030 Integrated Sustainable Urban Development Strategy – a green, sustainable, and resilient city – reflects the local administration's commitment to mobilizing financial resources for implementing initiatives related to sustainable energy, green infrastructure, and urban mobility.

Available financial resources are diversified and include European funds, such as those from the Regional Operational Program and other programs specifically funding EU sustainable development projects, as well as national and regional funds dedicated to combating climate change and promoting renewable energy. Strategic documents from M100 ambition highlight that Alba Iulia has successfully attracted external investments, including funds from Horizon Europe, Interreg Europe, URBACT, LIFE, CERV and other innovative financing schemes like municipal bonds, loans from commercial banks but also international Banks like EBRD to support sustainable development and renewable energy and energy efficiency projects.

Furthermore, financial resources also encompass the potential to utilize public-private partnerships (PPPs), which are essential for mobilizing private capital for green infrastructure projects and innovative technologies. Additionally, internal reallocations, such as savings from energy efficiency projects, support the funding of further climate initiatives.

The city's fiscal policies and strategy are aligned with sustainable development goals, focusing on investments in renewable energy, green infrastructure, and sustainable urban mobility, with the aim of reaching climate neutrality by 2035. Therefore, these resources are coordinated to support large-scale project implementation and ensure the long-term financial sustainability of the journey toward climate neutrality.

INCOME SOURCES FOR THE CITY⁴

Table 18 Income sources for the city

INCOME CATEGORY	CITY INCOME	% OF CITY BUDGET
EU funds	Grants and subsidies received from EU programs (e.g., PNRR, POR, Horizon Europe) aimed at supporting innovation, sustainable urban development, energy efficiency, mobility, and digitization efforts: €100,000,000 - €120,000,000	~50% - 70 % (significant for investments)
Local taxes and fees	Income tax (local share), property tax, goods and services tax, local fees and charges:	~45% - 55% (major income for operational budget)
Subventions from national budget	Transfers from national government to support local projects and services €35,000,000 - €50,000,000	~15%-30% (typical for Romanian municipalities)
Loans (e.g. EBRD loan)	Loan supporting cash flow: €15,000,000	~5% - 10%
Municipal Bonds - with green criteria included	€30,000,000	10%-15%
Other Revenues (service fees, fines, leases, donations, CSR etc.)	Smaller income sources not explicitly quantified but assumed <5% given usual municipal revenue patterns: €5,000,000 - €10,000,000	<5%
TOTAL INCOME	Approximately €100,000,000 million annually or over project funding cycles.⁴	100%

⁴ Explanation:

- The **EU funds** range is derived from the documented €350 million grants since 2007 and ongoing major projects such as those funded by PNRR and POR described in,, and.
- The **local taxes and fees** estimate is based on the project document indicating that local budget finances about 45-50% of total expenditures including capital and operation.
- **National government transfers** support a significant minority share (~10-15%) used especially in education, public buildings, and infrastructure maintenance, as per,.
- The **loans** figure corresponds to the €15 million EBRD loan mentioned in.
- **Municipal Bonds - with green criteria included**

Other smaller revenues such as fees, rents, and fines are estimated conservatively as <5% of total

CAPITAL SOURCES FOR THE CITY⁵

Table 19 Capital sources for the city

TYPE	SIZE RANGE	LEVEL	DESCRIPTION
Local Budget ⁵	10 million –14 million	Municipal	Annual municipal revenues from local taxes, fees, and operational income. Supports co-financing and operational costs of projects.
European Union Funds	60 million – 80 million	EU	Annual Grants and financing from EU programmes including: PNRR (National Recovery & Resilience Plan), POR (Regional Development Programs), Horizon Europe, LIFE, etc. Supports infrastructure, energy, mobility, sustainability projects
National/ regional Government Transfers	15 million –19 million	National/ Regional	Annual Government subventions and operational budget transfers supporting education, public services, and infrastructure
	15- 30 million	International	Annual Loan financing supporting cash flow and investment liquidity, e.g., EBRD loan facility of €15 million obtained by city
Private Sector Co-Funding / PPPs/ Loans (EBRD, municipal bonds, or other financial instruments)	Variable, 6-10 million	Private / Municipal	Annual Co-investment from private partners in projects such as smart city technologies, energy efficiency, some mobility initiatives
Other Local Revenues	2 million – 6 million	Municipal	Annual Fees, fines, rents, service charges providing supplementary income for city activities

⁵ **Local Budget:** Largest recurrent source funding core city operations, maintenance, and some project co-financing).

- **European Union Funds:** Largest capital influx for infrastructure, energy, and environmental projects. Includes PNRR, POR, Horizon Europe, LIFE programmes. Often >30% of total project funding.
- **National Government Transfers:** Support from central government, commonly for social services, education, and infrastructure projects.
- **Loans:** EBRD loan of €15 million facilitates cash flow and investment capability; may be joined by other potential loans.
- **Private Sector / PPPs:** Emerging source especially for smart city projects and energy efficiency (e.g., Siemens collaborations). Amounts vary and depend on project portfolios .
- **Other Revenues:** Moderate income from municipal rents, service charges, fees, fines to complement primary income streams .

COST SCENARIOS AND CAPITAL PLANNING

Present the estimated costs and capital planning associated with the actions outlined in the Climate Neutrality Action Plan. These should ideally serve as targets to optimise towards.

- Assess the anticipated financial implications for the city, both as implementation and ongoing operational costs, to inform adjustments to the city budget for their incorporation.
- Make sure that all the proposed actions are listed, including those pertaining to Governance Innovation and Social Innovation.
- Feel free to provide cost projections for the measures detailed in the Action Plan as appropriate.
- Outline the city's capital objectives and how you aim to achieve them, by leveraging various sources of capital.

Capital Planning and Financial Strategy for City Climate Contract M100

As part of its City Climate Contract M100, the City of Alba Iulia and its metropolitan localities are committed to achieving climate neutrality by 2035 while reducing CO₂ emissions by 85% by 2030. This ambitious transformation requires a comprehensive, strategic approach to capital planning, resource mobilization, and investment management across several key sectors. The goal is not only to meet the climate targets but also to ensure fiscal responsibility, long-term sustainability, and broad community engagement.

Total Investment Overview

The City Climate Contract M100 is backed by a total capital investment of €1,000,000,000. This funding is allocated across six core sectors: Energy Systems, Mobility and Transport, Waste and Circular Economy, Green Infrastructure, Built Environment, and Soft Interventions (Governance & Social Innovation). The overall investment strategy focuses on integrating public funds with private investments, leveraging EU support, and driving innovation to achieve transformative results.

Strategic Investment Breakdown

The total investment is strategically distributed to address key areas of urban transformation. The funding is designed to maximize environmental impact, ensure operational efficiency, and promote socio-economic development

Sector	Capital Allocation (€)	Strategic Objectives
Energy Systems	€500,000,000	Deploy renewable energy (solar, biomass, storage), upgrade energy efficiency, and modernize grids.
Mobility and Transport	€190,000,000	Develop sustainable transport infrastructure, electric vehicle fleets, and charging networks.
Waste and Circular Economy	€70,000,000	Improve waste management systems, recycling infrastructure, and support the circular economy.
Green Infrastructure & Nature-Based Solutions	€80,000,000	Create urban green spaces, restore floodplains, and foster a pedestrian-first environment.
Built Environment	€150,000,000	Retrofit buildings with renewable energy solutions, focusing on energy efficiency and low-carbon heating.
Soft Interventions (Governance & Social Innovation)	€10,000,000	Implement digital governance, education, and community engagement for sustainable living.

Capital Objectives and Financial Strategy

1. Energy Systems (€500M)

The core of the M100 strategy is the deployment of renewable energy and modernization of energy infrastructure. This will involve the installation of photovoltaic parks, biomass energy systems, and energy storage technologies, supported by an upgraded smart grid to integrate decentralized energy sources efficiently. The initial capital outlay of €500 million will be allocated across:

- **Renewable Energy Deployment (€300M):** Focused on scaling photovoltaic solar parks and biomass installations. Ongoing operational costs for these projects are estimated at €7–10M annually, covering maintenance, monitoring, and grid integration.
- **Energy Efficiency Upgrades (€120M):** Investments in energy retrofitting for public and private buildings, alongside the implementation of energy-saving technologies. This will result in operational savings that will offset around 60–70% of the maintenance costs.
- **Smart Grids & Utilities (€80M):** Modernizing grid infrastructure to improve energy distribution and enable real-time monitoring, ensuring the optimal operation of

renewable energy sources.

This sector's financing will rely heavily on EU climate funds, supplemented by national programs and private sector investments through Public-Private Partnerships (PPPs).

2. Mobility & Transport (€190M)

The mobility transformation will focus on eco-friendly transport infrastructure, including the expansion of electric vehicle (EV) fleets and the construction of EV charging networks. The allocation of €190 million will support:

- Development of EV infrastructure and smart transport systems, reducing emissions from both private vehicles and public transport.
- Creation of low-emission zones, bicycle lanes, and pedestrian-friendly urban areas to promote sustainable mobility.

Operational costs are estimated at €4–5 million annually, primarily for maintenance and infrastructure management, but these costs will be partially offset by revenue from mobility services and reduced air pollution.

3. Waste and Circular Economy (€70M)

A significant portion of the budget is dedicated to building a circular economy model through the deployment of advanced waste management systems, enhanced recycling infrastructure, and bio-waste processing technologies. The €70 million investment will include:

- Modernizing waste collection systems and increasing recycling rates.
- Implementing circular practices in both public and private sectors, focusing on material recovery and reduced landfill use.

While operational costs are expected to be €2 million annually, long-term savings will be driven by reduced waste management expenses and the monetization of recycled materials.

4. Green Infrastructure & Nature-Based Solutions (€80M)

Creating a more sustainable urban environment requires nature-based solutions, such as urban forests, green roofs, and parks. The goal is to foster a pedestrian-first city where nature and urban life are integrated, which also helps mitigate the effects of climate change, such as flooding and urban heat islands. The €80 million investment will support:

- Expanding urban forests, green spaces, and green corridors.
- Restoring floodplains and regenerating public spaces for community-oriented use.

Annual maintenance costs are estimated at €2.5 million, with significant long-term environmental benefits and enhanced social well-being.

5. Built Environment (€150M)

The built environment will see the integration of energy-efficient technologies and the adoption of renewable energy solutions in residential, commercial, and public buildings. This includes solar panels, biomass heating systems, and energy-efficient retrofits. The €150 million investment will support:

- Energy-efficient retrofitting of existing buildings.
- Large-scale deployment of local photovoltaic (PV) systems and biomass energy.

These measures will not only significantly reduce emissions from the building sector but will also deliver long-term savings in energy costs.

6. Soft Interventions (Governance & Social Innovation) (€10M)

The social innovation and governance innovation initiatives will focus on building a climate-conscious society through education, community engagement, and behavioural change. The €10 million allocation will be dedicated to:

- Digital governance platforms, enabling transparent decision-making and citizen engagement.
- Community outreach programs aimed at educating citizens on climate action, and supporting cleantech startups.
- Establishing participatory budgeting tools that empower citizens to co-invest in the city's climate projects.

These efforts will help build a collaborative environment, ensuring that climate actions have broad public support and lasting impact.

Financial Objectives and Leveraging Capital Sources

The city's approach to financing the City Climate Contract M100 will leverage a diverse mix of capital sources, including:

- EU funding through programs like Horizon Europe, Cohesion Funds, and LIFE.
- National and regional development funds focused on climate action and infrastructure.
- Private sector investment through Public-Private Partnerships (PPPs) and green bonds.
- Innovative financial instruments such as green municipal bonds, climate funds, and risk-sharing mechanisms to engage the private sector.
- Community participation via crowdfunding and participatory budgeting, ensuring



broad citizen ownership.

This multi-source financing strategy is designed to maximize resource mobilization, reduce financial risk, and create a sustainable, financially viable path toward achieving the city's climate goals.

Conclusion: Strategic Financial Path Forward

The City Climate Contract M100 represents a bold step towards a sustainable, carbon-neutral future for Alba Iulia and its metropolitan area. By strategically allocating €1 billion across targeted sectors and leveraging diverse financing mechanisms, the city aims to achieve its climate objectives while ensuring long-term financial sustainability. The proposed capital objectives, integrated with innovative funding solutions, will drive the successful implementation of this transformative strategy, positioning Alba Iulia as a leader in sustainable urban development and climate resilience.

This approach ensures that the city remains flexible and adaptable to evolving financial, technological, and policy landscapes, while maintaining a clear focus on its climate neutrality targets.

The Climate Neutrality Action Plan's capital framework reflects Alba Iulia's commitment to systemic, inclusive, and fiscally responsible climate action. The €1 billion investment target is both ambitious and grounded in financial realism, ensuring that the city and its metropolitan area are well-positioned to achieve deep decarbonization and climate resilience by 2035.

COSTS, CAPITAL PLANNING AND ECONOMIC INDICATORS BY ACTION

Make sure to list every one of the actions proposed in the previous chapter.

→ If feasible, in the fifth column, divide the costs based on the mentioned funding sources and indicate the amount that can be secured from each source individually.

Table 20 Cost, capital planning and economic indicators by action

FIELDS OF ACTION	ACTION	IMPLEMENTATION COSTS/ CAPEX	OPERATIONAL COSTS	POSSIBLE SOURCES OF CAPITAL	% OF THE TOTAL CLIMATE NEUTRALITY BUDGET	% OF THE TOTAL CO2 REDUCTION
ENERGY SYSTEMS	Renewable Energy Deployment	~300,000,000 (incl. photovoltaic installations on local roofs, biomass systems and other renewable energies)	Moderate, mostly maintenance	- EU Funds (Structural and Cohesion Funds): 30% - National grants: ~50% - Local budget and PPP: ~20% - Swiss Contribution - EEA, Innovation Norway - green / climate bonds - innovative procurement - innovative financial mechanisms - etc.	~30%	~30-35%

Energy Efficiency in Public and private Buildings	~120,000,000 (thermal rehabilitation, energy audits, modernizing heating)	Reduced net operational costs due to efficiency gains	- EU Structural Funds and LIFE program: 30% - ESCO investments/private partnerships: 20% Governmental funds 30%- EU Research and Innovation funding - Local and national energy infrastructure grants -ELENA (BEI) 20% -Swiss Contribution -EEA, Innovation Norway -green / climate bonds -innovative procurement -innovative financial mechanisms etc.	~12%	~40%
Smart Grid and Utilities	80,000,000 Integrated within renewable energy projects and energy efficiency upgrades;	Incremental operational costs for smart tech	- EU Structural Funds and LIFE program: 30% - ESCO investments/private partnerships: 20% Governmental funds 30%- EU Research and Innovation funding - Local and national energy infrastructure grants -ELENA (BEI) 20% -Swiss Contribution -EEA, Innovation Norway -green / climate bonds -innovative procurement -innovative financial mechanisms	~8%	~5%

MOBILITY AND TRANSPORT	Electrification of Transport Eco means of transportation both for public and private sector	190,000,000 Not fully quantified; includes installation of EV charging stations within retrofitting projects and ecologic means of transportation + rehabilitation of main public transport infrastructure at metropolitan level	Operational costs related to EV infrastructure maintenance	- EU Recovery and Mobility funds - EU Structural Funds and LIFE program: 30% - ESCO investments/private partnerships: 20% - Governmental funds 30%- - EU Research and Innovation funding - Local and national energy infrastructure grants -ELENA (BEI) 20% -Swiss Contribution -EEA, Innovation Norway - etc.	~19%	~8-10%
WASTE AND CIRCULAR ECONOMY	Waste Management and Recycling	Estimated around 70,000,000 for modern waste processing and circular economy initiatives	Operational costs for waste collection and processing	- EU funds, Circular Economy program: 40% - Local funds: 20% - other funding 10% - Private sector partnerships: ~30% -Swiss Contribution -EEA, Innovation Norway - etc.	~7%	~7-8%

GREEN INFRASTRUCTURE AND NATURE BASED SOLUTIONS	Urban Forestry & Nature-Based Solutions	Estimated around 80,000,000 for urban forests and green-blue infrastructure development	Low operational costs related to maintenance	- EU Recovery and Mobility funds - EU Structural Funds - EEA 20% - Governmental funds 30%- - Local and national green city grants- 20% - Swiss Contribution - EEA, Innovation Norway	~8%	~3-4%
				- BERD - Green City Action Plan - loans - PPPs - green / climate bonds - innovative procurement - innovative financial mechanisms etc.		
BUILT ENVIRONMENT	Local Energy Production Capacity	150,000,000 euros Covered within renewable energy deployment, including local PV and biomass systems	Maintenance and operation of production units	- Same as Renewable Energy Deployment	~15%	Included above

SOFT INTERVENTIONS (GOVERNANCE INNOVATION AND SOCIAL INNOVATION)	Public Participation and Awareness	Estimated 10,000,000 ~ for education, cleantech initiatives, and community engagement and trainings / changing mentalities	Low operational costs for program delivery	External funds - LIFE Program - URBACT, INTERREG EUROPE, EUI, other capacity building initiatives National Programs etc. 50% State Contribution: 30% Local budget: 20%	~1%	Indirect contribution
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Notes:

- Implementation costs are estimates based on available data from the Sustainable Energy and Climate Action Plan, Bold City Vision 2050, and SECAP documents [T1-T10].
- Funding sources include a mix of European Union funds (Structural, Cohesion, LIFE, Horizon Europe), national government grants, local municipality budgets, and private/public partnerships.
- Percentages for budget and CO2 reduction are approximations derived from sectoral emissions and planned investments („”).
- Some costs such as Smart Grid are integrated within other energy investments and not detailed separately.
- Continued updates to financing details and cost apportionment are expected as project designs mature

This overview reflects Alba Iulia’s holistic approach integrating energy, transport, waste, green infrastructure, built environment, and governance innovation sectors to achieve climate neutrality by 2035.

SUMMARISED COSTS AND CO2 REDUCTIONS BY FIELD OF ACTION

Table 21 Sumarised costs and CO2 reductions by field of action

FIELDS OF ACTION	TOTAL COSTS FOR ALL THE COVERED ACTIONS	% OF THE TOTAL BUDGET	TOTAL CO2 REDUCTIONS FOR ALL THE COVERED ACTIONS	% OF THE TOTAL CO2 REDUCTION
ENERGY SYSTEMS	Approx. 500,000,000 €	~50%	~65-75% of total CO2 reduction	~65-75%
MOBILITY AND TRANSPORT	Approx.190,000,000 €	~19%	~15-20% of total CO2 reduction	~17%
WASTE AND CIRCULAR ECONOMY	Approx. 70,000,000 €	~7%	~6-8% of total CO2 reduction	~7.5%
GREEN INFRASTRUCTURE AND NATURE BASED SOLUTIONS	Approx.80,000,000 €	~8%	~3-4% of total CO2 reduction	~3.5%
BUILT ENVIRONMENT	Approx.150,000,000€	~15%	Accounted within Energy Systems	-
SOFT INTERVENTIONS (GOVERNANCE INNOVATION AND SOCIAL INNOVATION)	Approx 10,000,000	~1%	Indirect impact	<1%
TOTAL	~1,000,000,000	100%	100%	100%

FINANCIAL INDICATORS FOR MONITORING, EVALUATION AND LEARNING

Briefly present the used monitoring indicators and explain them, if necessary.

(insert here: text + if necessary, relevant visuals - pictures, figures, charts)

Monitoring and evaluation of climate policy implementation in Alba Iulia utilize specific financial indicators that relate CO₂ emissions reduction to the capital invested in each field of action. These indicators enable assessing the cost-effectiveness and environmental impact of investments while guiding future allocation of resources.

The key financial indicators include the ratio of CO₂ kilograms reduced per euro invested (CO₂ kg/euro) for individual actions and aggregated totals per field. This allows tracking the efficiency of capital deployment in achieving greenhouse gas mitigation goals.

FINANCIAL INDICATORS BY FIELD OF ACTION

Table 22 Financial indicators by field of action

FIELDS OF ACTION	INDICATOR	INDICATOR VALUE AND UNIT
ENERGY SYSTEMS	Thermal rehabilitation of municipal and residential buildings	~3.4 kg CO ₂ / €
	Installation of photovoltaic panels on public buildings	~2.6 kg CO ₂ / € (based on renewable energy production)
	Modernization of biomass heating systems	Not explicitly quantified in documents
	TOTAL CO ₂ REDUCTION / CAPITAL INVESTED	~25% reduction over 12 years with >80% of projects on energy efficiency; exact tons/€ unavailable
MOBILITY AND TRANSPORT	Expansion of the network of bicycle paths	Not explicitly quantified; benefits discuss traffic reduction and air quality improvements
	Electrification of public transport	Approx. 162 tons/year CO ₂ reduction via electric buses and infrastructure over multi-million € investments

	Promotion of car-sharing and alternative transport systems	Not quantitatively specified; qualitative benefits only
	TOTAL CO ₂ REDUCTION / CAPITAL INVESTED	Partial contribution within overall 25% reduction
WASTE AND CIRCULAR ECONOMY	Implementation of separate waste collection systems	Not quantified; Circular Economy Action Plan discussed but no direct CO ₂ €/kg data
	Development of infrastructure for recycling and reuse	Not quantified
	TOTAL CO ₂ REDUCTION / CAPITAL INVESTED	Data not available
GREEN INFRASTRUCTURE & NATURE-BASED SOLUTIONS	Landscaping of parks and green spaces in urban areas	Not quantified
	Restoration and creation of wetlands for water retention	Not quantified
	Planting tree alignments to reduce pollution	Not quantified
	TOTAL CO ₂ REDUCTION / CAPITAL INVESTED	No quantified data available
BUILT ENVIRONMENT	Urban regeneration and rehabilitation of historic buildings	Not explicitly quantified
	Implementation of smart building systems	Energy smart metering planned; energy savings 12–36 MWh/year in tertiary buildings for some actions
	Modernization of utility networks (public lighting, heating)	Some public lighting modernization; partial energy savings and cost data
	TOTAL CO ₂ REDUCTION / CAPITAL INVESTED	Reduction part of total 25% city-wide CO ₂ drop; exact value unknown
SOFT INTERVENTIONS (GOVERNANCE, INNOVATION AND SOCIAL INNOVATION)	Climate change education and awareness programs	Not quantified
	Developing administrative and implementation capacity for climate action	Not quantified
	Promoting cross-sectoral partnerships and cooperation	Not quantified
	TOTAL CO ₂ REDUCTION / CAPITAL INVESTED	No quantified data available

Description:

- The overall CO2 reduction for Alba Iulia is about 25% between 2008-2020, equating to 54,575 tons CO2 reduced.
- Over 80% of projects contributing to reduction are in energy efficiency, which covers thermal rehab, renewable installations, and smart building systems.
- Financial data is partial but local budgets, EU funds (e.g., Interreg Europe), and external projects contribute. Mobility actions notably include electrification of public transport and expansion of infrastructure for sustainable transportation.
- Waste and circular economy benefits and specific CO2 kg/€ are not quantified in the provided documents.
- Soft interventions are recognized but without quantifiable CO2 or financial metrics.

This action plan will contribute also in reducing costs for public utilities and also for private owners of buildings with approx. 60%.

CLIMATE POLICIES FOR CAPITAL FORMATION AND DEPLOYMENT

Shortly describe the climate policies you will develop and use for capital accumulation and deployment.

Alba Iulia's climate policies for capital accumulation and deployment focus on advancing a comprehensive, cross-sectoral approach to achieve climate neutrality by 2030 at local level and by 2035 at metropolitan level, aligning with EU and national frameworks and leveraging local expertise and funding mechanisms. The policies are designed to mobilize investments by creating conducive regulatory environments, enhancing human capital capabilities, and fostering multi-stakeholder collaboration.

Key climate policies to be developed and used for capital formation and deployment include:

1. Energy Efficiency and Sustainable Infrastructure Policy

This policy promotes retrofitting and upgrading residential, public, and tertiary buildings with energy-efficient technologies, alongside sustainable urban infrastructure improvements such as public lighting modernization and waste-to-energy technologies. It encourages utilization of EU funds, national resources, and private investments coordinated by the municipality's dedicated teams.

Sector: Energy, Buildings, Urban Infrastructure

Targeted Audience: Residents, local businesses, construction and utility companies, investors

2. Sustainable and Low-Emission Mobility Policy

The city advances programs to expand green mobility options including cycling infrastructure, public transport enhancements, and reduction of emissions from transport fleets. This includes integrating smart city technologies for optimized transport operations.

Sector: Transport, Urban Mobility

Targeted Audience: Citizens, transport operators, investors, technology providers

3. Circular Economy and Waste Management Policy

To promote resource efficiency, reduce waste, and enable waste-to-energy opportunities, this policy fosters circular economy principles that stimulate innovation and investment in recycling and sustainable consumption.

Sector: Waste Management, Circular Economy

Targeted Audience: Local industries, waste operators, citizens, innovators

4. Climate Adaptation and Resilience Policy

This policy formulates adaptation strategies responding to identified local climate risks, including development of green-blue infrastructure, flood risk management, and urban ecosystem enhancement, guided by national and EU climate adaptation directives.

Sector: Environment, Urban Planning

Targeted Audience: Municipal planners, environmental agencies, citizens

5. Stakeholder Engagement and Capacity Building Policy

Emphasizes increasing climate awareness and participation, training municipal staff and local stakeholders, and fostering collaboration with academia, financial institutions, NGOs, and citizen groups to enable effective project development and capital mobilization.

Sector: Cross-sectoral

Targeted Audience: Municipal authorities, citizens, NGOs, academia, private sector (insert here: text + if necessary, relevant visuals - pictures, figures, charts).

CLIMATE POLICIES TO ENABLE CAPITAL DEPLOYMENT

Table 23 Climate policies to enable capital deployment

CLIMATE POLICY	DESCRIPTION OF THE POLICY	INTENDED OUTCOME FOR CAPITAL FORMATION
Energy Efficiency and Infrastructure	Promote energy-saving technologies and sustainable urban infrastructure projects through incentives and targeted investments.	Attract capital to retrofitting projects and sustainable infrastructure, leveraging public and private funding sources.
Sustainable Mobility	Implement green transport solutions and smart mobility systems to reduce transport emissions and enhance efficiency.	Mobilize investments in low-emission transport infrastructure and services, generating market confidence for green mobility.
Circular Economy	Foster circular business models and integrated waste management with an emphasis on recycling and waste valorization.	Redirect capital towards circular economy projects, creating new economic opportunities and reducing environmental costs.
Climate Adaptation	Develop resilience-building measures addressing urban climate vulnerabilities through infrastructural and ecosystem-based solutions.	Secure funding for adaptive infrastructure enhancing city's resilience, ensuring risk mitigation and long-term sustainability.
Stakeholder Engagement and Capacity Building	Strengthen local capacities and engage multi-sectoral stakeholders to co-create climate projects and enhance funding absorption.	Create enabling environment for project development, increasing readiness for capital deployment and funding acquisition.

This integrated policy framework supports Alba Iulia's ambition for climate neutrality by 2030 and for 2035 neutrality at metropolitan area, ensuring effective formation and deployment of capital from diversified sources including own funds, regional, national, and EU financing mechanisms.

IV. OUTLOOK AND NEXT STEPS



Provide a short overview of the future steps for the Action Plan, including the methods, tools, frequency, and milestones for implementation, monitoring, updating and improvement.

- Mention the main implementation thresholds and areas requiring future improvement of documentation, including the envisioned approach for addressing them.**
- Make note of periodic iteration and review sessions.**

The future steps for the Action Plan involve a structured approach to implementation, monitoring, and continual improvement to ensure the plan's effectiveness and adaptability. The process will be guided by a combination of methods, tools, and milestones designed to facilitate systematic progress and responsiveness to emerging needs.

Methods and Tools:

- **Quantitative and Qualitative Monitoring:** Regular data collection via surveys, interviews,

and digital systems to assess citizen satisfaction and project performance.

- **Digital Platforms and Dashboards:** Use of digital dashboards for real-time tracking of key performance indicators, energy consumption, and project milestones.
- **Participatory Engagement:** Utilization of participatory budgeting and public consultations to incorporate stakeholder feedback and align actions with community needs.
- **Benchmarking and KPIs:** Ongoing assessment against local, national, and international KPIs to gauge progress and identify areas for adjustment.

Frequency and Milestones:

- **Quarterly Reviews:** Short-term reviews to evaluate ongoing projects, address immediate issues, and adjust operational strategies.
- **Annual Monitoring and Reporting:** Comprehensive assessments of progress towards strategic objectives, documenting achievements, challenges, and lessons learned.
- **Major Review Gates (Every 3-5 Years):** Formal reevaluation of the plan's direction, with updates to objectives, strategies, and documentation based on technological, policy, and socio-economic developments.

Multiple Implementation Thresholds:

- Achievement of specific project milestones (e.g., renewable capacity targets, energy efficiency improvements).
- Compliance with legal and policy frameworks, including EU and national regulations.
- Securing financial and technical resources necessary for advancing project phases.
- Incorporation of new technologies or innovative practices identified during review cycles.

Areas Requiring Future Improvement:

- **Documentation Quality and Detail:** Enhancing the granularity of project documentation, including resource allocation, technical specifications, and expected impacts.
- **Interoperability and Data Integration:** Further improving the integration of monitoring tools and systems to ensure comprehensive data analysis.
- **Capacity Building:** Strengthening internal institutional capacity for project management, technical implementation, and policy adaptation.

Envisioned Approach for Addressing Documentation Gaps:

- Establish systematic documentation protocols aligned with international standards.

- Incorporate lessons learned and best practices into updated documentation and plans.
- Schedule periodic workshops to refine methodologies, tools, and reporting structures.
- Maintain an open feedback loop with stakeholders to continuously improve transparency and accountability.

Periodic Iteration and Review Sessions:

- Regularly scheduled stakeholder meetings and technical workshops to review progress.
- Adjustment of strategies based on monitoring outcomes, technological advancements, and policy changes.
- Feedback incorporation from citizens and partners to refine future actions.

This iterative approach aims to keep the Action Plan dynamic, adaptable, and aligned with evolving sustainability and smart city objectives, fostering continuous improvement and stakeholder engagement.

V. ANNEXES

Include any annexes you consider to be necessary for a better comprehension and / or for the consolidation of the Climate Neutrality Action Plan.