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Climate Neutrality Transition Roadmaps

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Abbreviations

3D	Three-Dimensional
AFOLU	Agriculture, Forestry, and Other Land Use
Agri-PV	Agricultural Photovoltaics
EIB	European Investment Bank
EU	European Union
ETS	Emissions Trading Scheme
EV	Electric Vehicles
GHG(s)	Green-house Gases
IPCC	Intergovernmental Panel on Climate Change
LULUCF Regulation	Land Use, Land-Use Change, and Forestry Regulation
NIMBY	"Not In My Back Yard"
NGOs	Non-Governmental Organizations
PNNR	Piano Nazionale di Ripresa e Resilienza (NRR- National Recovery and Resilience Plan)
POD	Protected Designation of Origin
REC	Renewable Energy Communities
RRF	Recovery and Resilience Facility
SECAP	Sustainable Energy and Climate Action Plan
SDGs	Sustainable Development Goals
SMEs	Small and Medium Enterprises
SWOT	Strengths, Weaknesses, Opportunities, Threats

Executive summary

The Climate Neutrality Transition Roadmaps developed within **CO2 PACMAN,** address a central challenge shared by many Mediterranean islands: **how to transform climate-neutrality ambitions into realistic, territorially grounded, and implementable transition processes**. In island contexts often characterised by limited resources, infrastructural constraints, governance fragmentation, and strong environmental pressures, the project explored how climate planning can become more operational, participatory, and locally embedded.

The Roadmaps build directly upon the methodological and governance foundations previously developed within CO2 PACMAN. **The Toolkit for the Development of Climate Neutrality Scenarios** (Output 1.1) provided the analytical framework and participatory approach for assessing greenhouse gas emissions and exploring alternative transition pathways. Complementing this, the **Multilevel Cooperation Map** (Output 2.1) established the stakeholder and governance structures required to coordinate actors across institutional levels and sectors. The Climate Neutrality Transition Roadmaps represent the operational application of these components, translating methodological foundations and governance procedures into territorially grounded transition pathways for the pilot islands.

Through pilot experiences in **Brač (Croatia), Elba (Italy), and Crete (Greece)**, the project tested an integrated methodological approach that combined **greenhouse gas accounting, spatial analysis, participatory processes, innovation-oriented collaboration, and financing and implementation planning**. Rather than applying predefined decarbonisation models, the Roadmaps were developed through territorially grounded and co-creative processes capable of adapting transition strategies to the environmental, governance, infrastructural, and socio-economic characteristics of each territory.

Across the three pilot islands, the Roadmap development process integrated:

- greenhouse gas inventories and climate-neutrality scenario development;
- renewable-energy and decarbonisation strategies;
- landscape planning and Virtual Reality visualization;
- participatory and youth-engagement activities;
- Open Innovation actions addressing local operational and environmental challenges;
- co-created policy simulations and territorial transition priorities;

- financing pathways and implementation-capacity assessment.

The pilot experiences demonstrated that climate neutrality for island territories cannot be approached exclusively as a technical mitigation objective. Effective transition processes require the combination of **analytical evidence**, **territorial knowledge**, **collective participation**, **institutional coordination**, and **long-term implementation capacity**. In this respect, the Roadmaps helped transform collectively discussed visions of transition into more operational and feasible trajectories adapted to local territorial conditions.

Several strategic priorities consistently emerged through the co-creation activities developed across the pilot islands, including the expansion of **renewable energy systems**, the improvement of **sustainable mobility solutions**, the reinforcement of **resource efficiency and circular approaches**, the enhancement of **local governance coordination**, and the ability to connect climate-transition strategies with realistic financing opportunities and long-term implementation mechanisms.

Beyond the specific pilot experiences, **CO2 PACMAN** also demonstrates strong replication potential for other Mediterranean islands and coastal territories facing similar decarbonisation and governance challenges. **The modular structure of the methodological approach allows different territorial contexts to adapt individual components according to their own priorities, institutional capacities, and transition needs, while maintaining methodological coherence and comparability of results**.

The Roadmaps also contribute to broader sustainable development and climate governance objectives, particularly the Sustainable Development Goals (those related to affordable and clean energy SDG7, sustainable cities and communities SDG11, and climate action SDG13). At the same time, the approach remains aligned with the principles underpinning the **Covenant of Mayors Climate and Energy Framework**, the development of **Sustainable Energy and Climate Action Plans (SECAPs)**, and key European and Euro-Mediterranean policy frameworks supporting climate neutrality, territorial resilience, and integrated local governance.

Overall, the **Climate Neutrality Transition Roadmaps, developed within CO2 PACMAN, provide not only strategic planning tools but also a transferable, implementation-oriented methodological framework to support future climate-transition processes across Mediterranean islands and coastal territories**.

From Assessment to Action: Co-Creating Climate Neutrality Roadmaps

Mediterranean islands are increasingly recognised as **key territories for the climate transition** due to their exposure to environmental pressures and their strategic role in advancing **sustainable energy and resource management solutions**. Structural characteristics such as **energy dependence, seasonal tourism pressures, fragile ecosystems, and complex governance dynamics** make these territories both **highly vulnerable to climate impacts**, and at the same time they represent particularly relevant contexts for developing **locally adapted transition strategies**.

In this context, the **Climate Neutrality Transition Roadmaps** developed for Brač (Croatia), Elba (Italy), and Crete (Greece) represent the **concrete results** of the methodological and governance foundations developed through the *CO2 PACMAN Toolkit for the development of climate neutrality scenarios (Output 1.1)* and the *Multilevel Cooperation Map (Output 2.1).* While Output 1.1 provided the tools and participatory structure to assess emissions and engage stakeholders, the Roadmaps translate that framework into **clear strategic transition pathways** tailored to each island.

These Roadmaps are neither stand-alone climate plans nor purely technical inventories. They represent **co-created transition strategies** that combine solid data, local knowledge, and stakeholder perspectives within a practical, **adaptable framework**. Through baseline analysis, scenario exploration, and stakeholder dialogue, the Roadmaps connect **evidence with action** and **vision with feasibility**.

Islands provide a unique scale for **climate governance innovation**. Their defined boundaries enable systemic thinking, yet their economic and social complexity - especially regarding tourism, transport, and energy imports requires balanced and **realistic transition strategies**. The co-creation process ensured that the Roadmaps reflect **local priorities**, **existing governance capacities**, and **community perspectives**, thereby providing administrations with a structured, **ready-to-use transition framework**.

Importantly, the Roadmaps are built on an **integrated approach to greenhouse gas accounting**, linking **emissions analysis directly to strategic actions and monitoring**. The calculation of the **GHG Balance for each island established a quantitative baseline for emissions and uptake**, identifying the main drivers of emissions and their mitigation potential. The **CO2 PACMAN Tool** was subsequently used to **analyse and compare alternative policy** combinations and **estimate their effects on the overall GHG balance** (Figure 1). It is important to note that **the Tool does not provide solutions** for the PAs to adopt; instead, it serves as **a decision-support instrument that enables stakeholders to explore and compare different combinations of policy measures and identify transition pathways that best reflect local priorities, capacities, and ambitions.** Or, in other words, the Tool works like a “menu of ingredients” from which each person or group of persons

can pick his/her/their preferred “recipe” in terms of policies to be adopted.

Figure 1: From GHG balance assessment to decarbonization strategies and action planning within the Climate Neutrality Roadmap process.

Building on this assessment phase, **landscape scenario development translated mitigation priorities into spatial configurations**, allowing stakeholders to explore how technological and policy interventions would interact with territorial characteristics and land-use patterns. **Virtual Reality** simulations further supported this process by enabling **place-based visualisation of proposed solutions** and facilitating informed deliberation.

By addressing the **frequent gap between carbon accounting and policy implementation**, the Roadmaps strengthen the **link between assessment and action**.

The co-creation dimension underpinning these Roadmaps was further structured and consolidated through the ***Multilevel Cooperation Map* (Output 2.1)**. While the Toolkit focused on **analytical assessment** and **participatory scenario exploration**, the Cooperation Map operationalised the **multi-level stakeholder involvement dimension** by organising the actors engaged throughout the process into a **structured cooperation ecosystem**. This **governance layer** ensures alignment among assessment, co-design, and potential implementation, strengthening the continuity of cooperation and the **capacity for implementation** activated during the project.

Differentiated engagement formats ensured that the transition process was both inclusive and tailored. The **AskyourcitizenonCaN survey captured initial perceptions and priorities** from the broader community, providing a social baseline that complemented the technical GHG Balance. The **Youth Think Tank engaged students in developing forward-looking proposals**, while **Open Innovation Cooperative Actions connected challengers and solvers**, including SMEs, to explore concrete technological and business responses. The **Vox Populi feedback** phase publicly presented and discussed the survey results and emerging priorities, allowing for **collective validation** and refinement of strategic directions. Finally, the **economic feasibility of the co-created vision of the "*Island I Would Like*"** was assessed by identifying potential funding schemes and financial mechanisms to support the proposed technological, landscape, and policy solutions. By linking strategic priorities to concrete financing pathways, this step helped transform collectively imagined scenarios into implementable transition trajectories.

Figure 2 illustrates how the **CO2 PACMAN Toolkit intervention logic** evolves into the design of the Climate Neutrality Roadmaps, highlighting the progression from **assessment** to **scenario development** and **strategic roadmap architecture**, with a multilevel stakeholder cooperation layer supporting the process throughout.

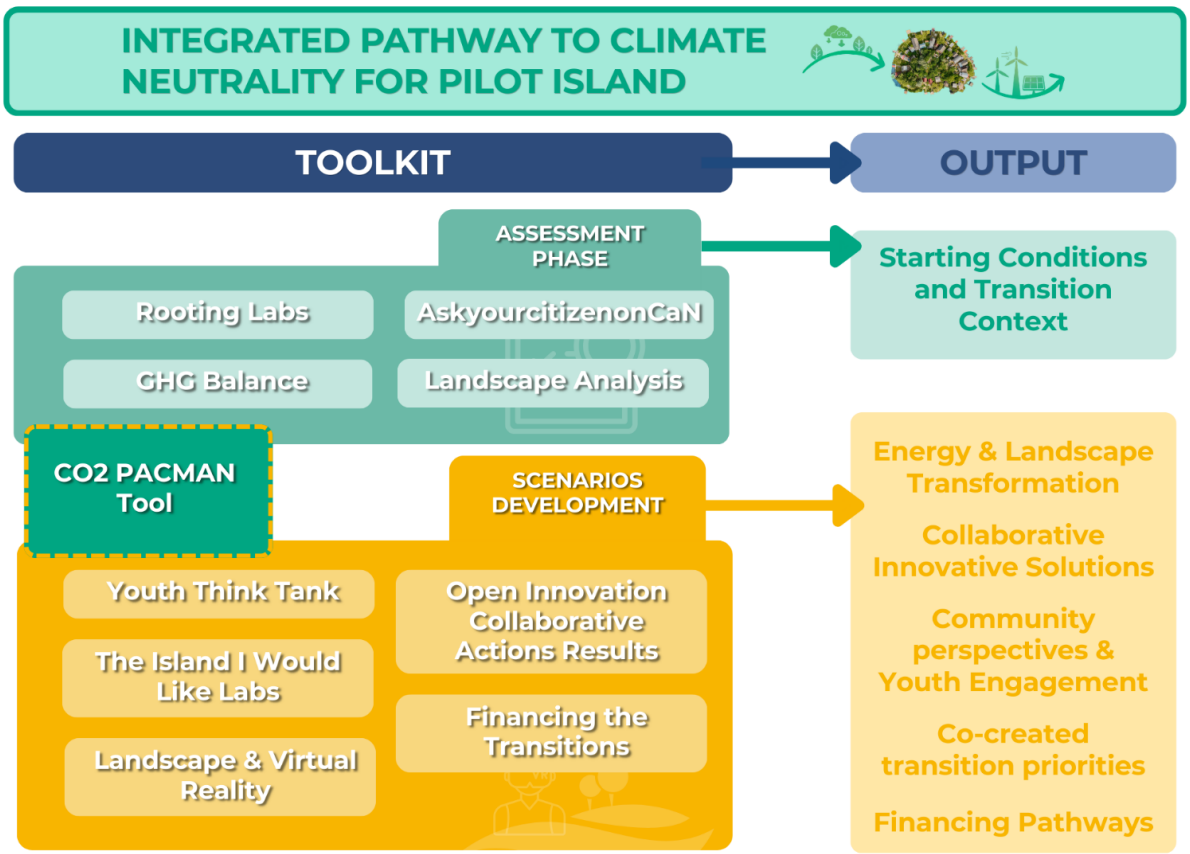

Figure 2: From CO2 PACMAN Toolkit Intervention Logic to Climate Neutrality Roadmaps

These Roadmaps aim to provide **coherent and feasible transition strategies**, grounded in **reliable data**, **realistic implementation conditions**, and **participatory consensus**. They provide a **structured strategic direction** that can evolve alongside political priorities and funding opportunities.

By positioning Brač, Elba, and Crete as **pilot territories and flagship transition experiences**, this document contributes to a broader reflection on how Mediterranean islands can move from **climate vulnerability to transition leadership**. The lessons emerging from this process guide other **islands and coastal areas across the Euro-Mediterranean region**.

The sections that follow translate this framing into **concrete transition pathways** for Brač, Elba, and Crete, and then reflect on **shared policy implications**, **broader relevance, replicability**, **and long-term legacy**.

Brač – Climate Neutrality Transition Roadmap

The **Climate Neutrality Transition Roadmap for Brač** consolidates the results of the co-creation process carried out during the project, translating **technical analysis and stakeholder dialogue** into a structured transition vision for the island.

Following the assessment phase, which clarified the island's emissions profile and structural characteristics, the focus shifted from understanding **"where Brač stands"** to outlining **its pathway towards climate neutrality**. This transition was developed through an iterative process combining quantitative assessment, stakeholder engagement, spatial exploration, and policy discussion.

Rather than presenting a predefined list of sectoral measures, the Roadmap integrates **technical evidence, territorial knowledge, and community perspectives** to identify realistic transition directions. Through scenario exploration, participatory dialogue, and spatial visualisation tools, stakeholders examined how different technological and policy options could interact with the island's environmental and socio-economic context.

In this sense, the Roadmap does not simply list mitigation measures. It brings together **analytical insights, community priorities, and spatial considerations** into a coherent territorial transition process for Brač, outlining the possible trajectory toward a decarbonised island's future, envisioned through the participatory process (Figure 3).

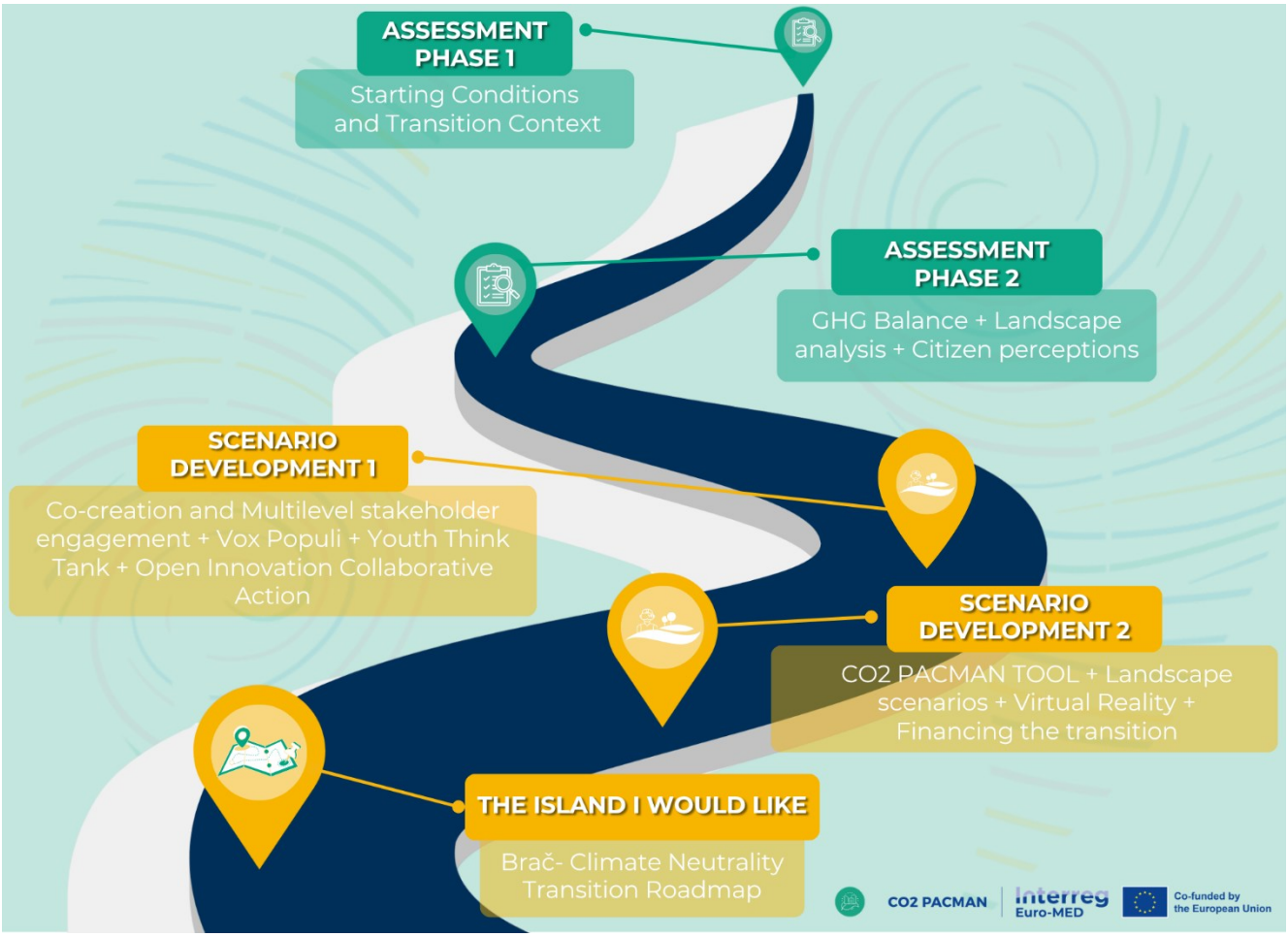

Figure 3: Conceptual pathway guiding the development of the Climate Neutrality Transition Roadmap for Brač.

Starting Conditions and Transition Context

The Climate Neutrality Transition Roadmap for Brač builds on a comprehensive understanding of the island's **greenhouse gas profile**, its **territorial characteristics**, and its **stakeholder dynamics**.

The assessment phase highlighted the **predominance of the Energy sector**, accounting for approximately 68% of gross emissions (62.97 kt CO_2eq). This reflects the island's structural dependence on external energy supply and consumption patterns linked to buildings and mobility. The **AFOLU sector** accounts for 21% of emissions (20.15 kt CO_2eq), underscoring the island's dual land-use nature. While agricultural and land-based activities emit, they also play a crucial role in **carbon uptake**. The **Waste sector** accounts for 11% (9.9 kt CO_2eq), whereas the **industrial process sector** accounts for 0 kt CO_2eq in the CO2 PACMAN assessment framework, since the IPCC methodology includes only process emissions from mineral, chemical, and metal production activities, which are absent in

Brač. Emissions associated with the energy use in all sectors are accounted for within the Energy sector (energy consumption).

Overall, gross emissions amount to 93.1 kt CO_2eq. Thanks to significant **natural carbon sinks**, approximately 92% of these emissions are compensated, resulting in net emissions of 7.5 kt CO_2eq. **This configuration places Brač relatively close to climate neutrality on a net basis.** At the same time, it reveals a structural reliance on **energy-related mitigation pathways** and the need to safeguard existing absorption capacities.

Beyond the quantitative profile, the territorial and socio-economic context further shapes the transition roadmap. The process was activated with the first **Rooting Lab**, which brought together public authorities, infrastructure providers, SMEs, schools, and civil society. Through structured dialogue, data exchange, and collective **SWOT reflection**, stakeholders jointly interpreted the island's baseline conditions and identified both strengths and structural constraints. Clean energy potential, strategic location, fisheries, and strong community involvement emerged as key assets. At the same time, high operational costs, an aging population, import dependency, water scarcity, and waste management challenges were recognised as critical vulnerabilities. Tourism seasonality and climate-related risks add further complexity, reinforcing the need for **adaptive and resilient strategies**.

In parallel, the **AskyourcitizenonCaN survey** revealed strong environmental awareness among residents: 88% of respondents reported awareness of climate change, and 57% considered mitigation measures necessary. However, only 32% were optimistic about achieving climate neutrality by 2040. Citizens identified renewable energy and waste management as priority areas (75%), followed by sustainable agriculture (46%), transport improvements (26%), and building efficiency (24%). These findings demonstrate a significant alignment between the **technical assessment** and **community perception**, particularly regarding the central role of energy and waste in the island's transition. A **large share of respondents (75%)** expressed a **preference for maintaining current landscape conditions**, while 21.26% supported change under specific conditions and 3.86% were indifferent. This highlights the importance of landscape considerations in shaping the island's transition process.

Early stakeholder exchanges further highlighted the need for an integrated local sustainability strategy, enhanced community awareness initiatives, improved waste-reduction practices, water-reuse and rainwater-collection systems, agricultural innovation, and incentive-based regulatory approaches. Seasonal tourism dynamics were recognised as a structural factor shaping resource demand and sustainability challenges, reinforcing the need for integrated and context-sensitive transition strategies. These early insights progressively shaped the **strategic orientation of the Roadmap**, ensuring it reflects priorities that emerge directly from the island's socio-economic and environmental context.

Taken together, Brač's starting conditions reveal a territory with **strong environmental**

assets and high community awareness, yet exposed to **structural constraints linked to energy dependency, water scarcity, and seasonal pressures**. These conditions provide the starting point for defining the island's **transition pathway** (Figure 4).

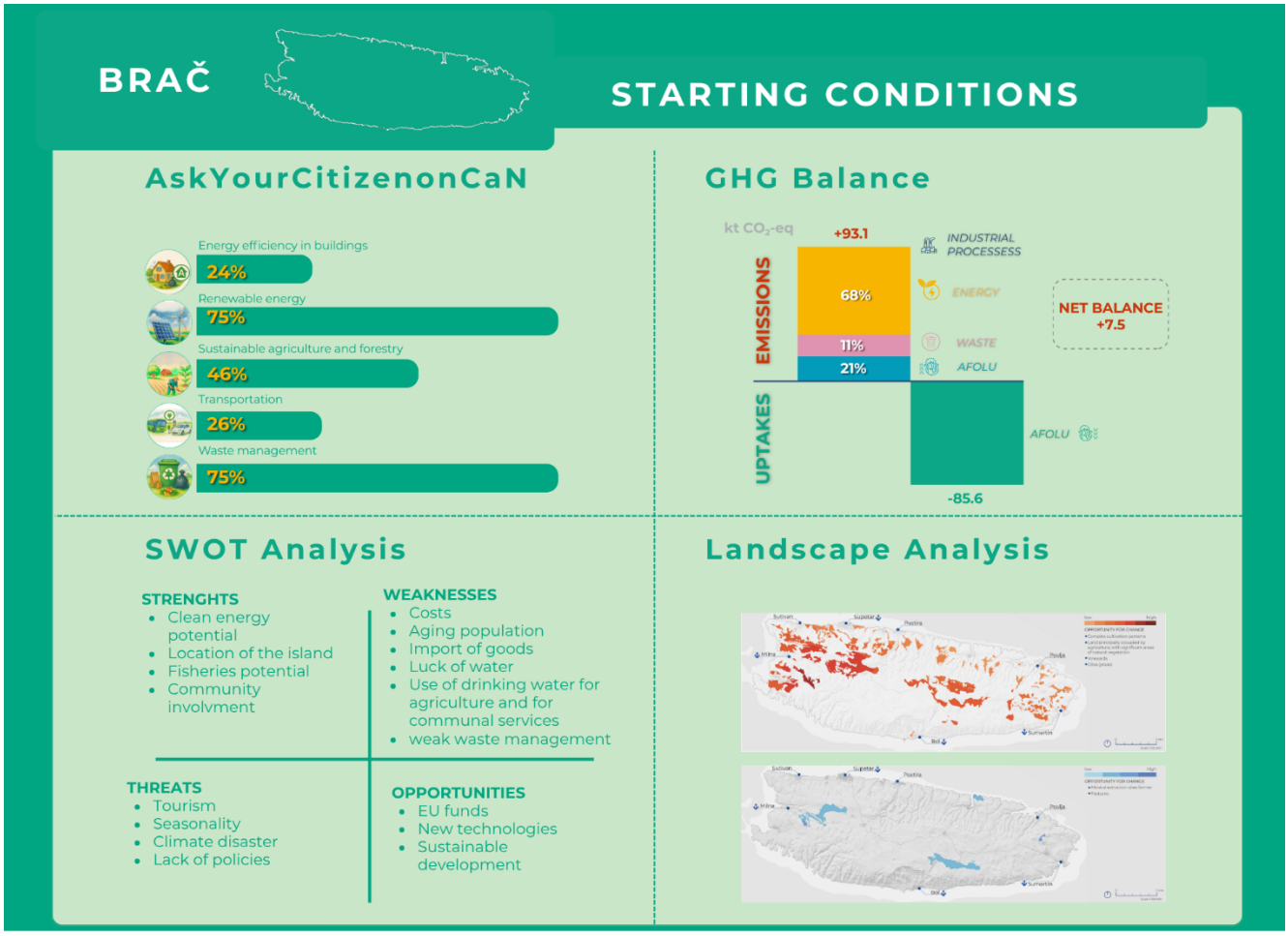

Figure 4: Overview of Brač's starting conditions: presenting greenhouse gas balance assessment, territorial and SWOT analysis, and citizen perception insights collected during the Rooting Lab process.

The **Climate Neutrality Transition Roadmap**, therefore, translates these insights into a **structured decarbonization pathway for Brač**, aligning **technical analysis**, **territorial conditions**, and **community priorities** to guide the island's **long-term climate transition**.

Brač's Integrated Pathway to Climate Neutrality

The transition architecture of Brač is articulated across five interconnected dimensions, integrating technical modelling, spatial planning, stakeholder engagement, innovation-driven solutions, and financial feasibility.

Energy & Landscape Transformation

Deploying renewable energy resources constitutes the **structural pillar of Brač's pathway toward climate neutrality**. Based on the **greenhouse gas balance**, meeting the carbon neutrality goal requires approximately **74,228 MWh of renewable energy production**, corresponding to an installed capacity target of around 8.5-9 MW. This would avoid approximately **19,386 tonnes of CO_2**, an amount comparable to the absorption capacity of **14.4 km² of forest**.

However, the integration of renewable energy on Brač was not treated as a purely technical siting exercise. It was developed through a **landscape-based process**, structured in progressive phases:

- analysis of **landscape features** (morphology, land-use mosaic, natural energy expression of sun and wind),
- diagnosis of **landscape suitability**,
- assessment of **landscape capabilities**,
- **scenario planning**,
- and design of **landscape samples**.

This approach reflects the principle, embedded in the **European Landscape Convention**, that landscape must be integrated into regional and sectoral planning policies, including energy transition strategies. Rather than producing deterministic or technocratic prescriptions, the process was designed to remain **understandable, participatory, and open to public deliberation**.

To support the interpretation of these scenarios, the CO2 PACMAN also developed an **immersive 3D visualization of the proposed energy setups**, enabling stakeholders and residents to explore possible changes to the island landscape from a human perspective. Instead of only using maps or technical plans, the virtual environment allowed participants to view renewable installations from multiple angles - including village, coastal, and aerial views - encouraging a more informed discussion about how the **landscape fits and the visual effects**. This visualization tool helped connect **technical planning with public perception**, enhancing the participatory aspect of the transition process (Figure 5).

Figure 5: Wind turbines visualised within the Brač landscape through the immersive VR simulation

Building on the landscape-based assessment, **three integrated and interchangeable perspectives** were developed.

Scenario 01 – Landscape Mosaic and Decentralized Agrivoltaics

This scenario proposes maintaining the **traditional landscape mosaic** while integrating renewable production through **agrivoltaic pergolas and building-integrated photovoltaic systems**. Installed capacity would be distributed across connected parcels, potentially led by family farms and energy cooperatives.

This model aligns renewable deployment with **agricultural diversification and climate adaptation strategies**. During the Lab discussions, this scenario resonated particularly strongly with stakeholders for its **realism, engagement, and perceived contribution to climate neutrality**, especially given its compatibility with Brač's agricultural identity and territorial structure (Figure 6).

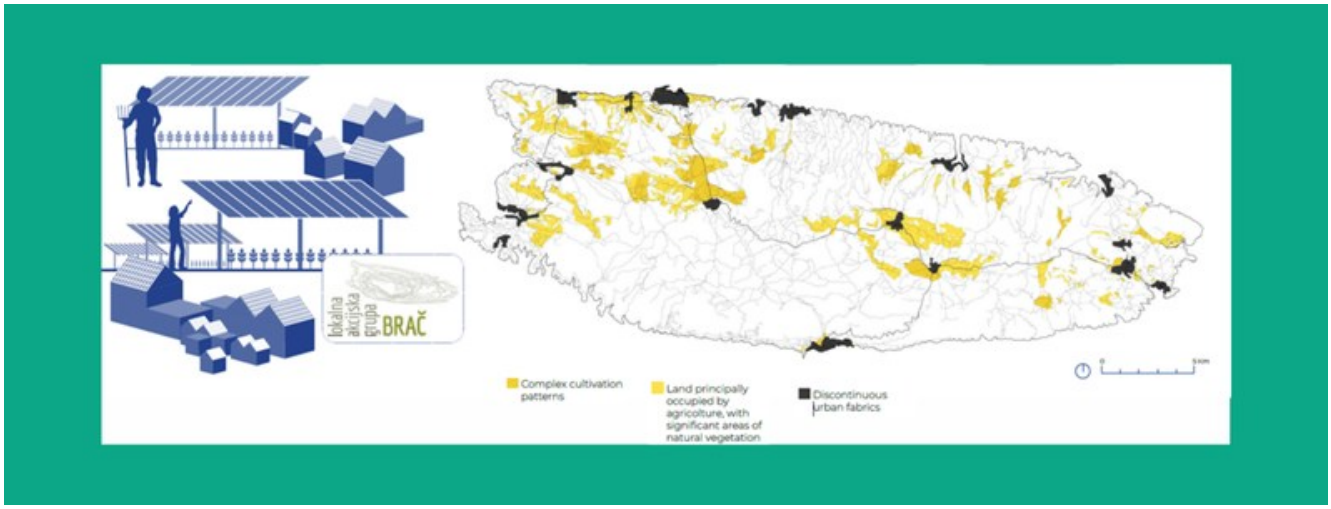

Figure 6: Landscape Mosaic and Decentralized Agrivoltaics scenario for Brač.

Scenario 02 – Wind and Habitat Regeneration

The second scenario combines **wind turbines (up to six units)** with **ground-mounted photovoltaic arrays located in former mineral extraction sites**. With installed capacity potentially exceeding 10 MW, this scenario follows a more **centralized investment logic**, involving regional and international actors.

A distinctive feature of this configuration is the coupling of renewable development with **habitat recovery**. Wind park infrastructure may integrate **ecotourism pathways**, while photovoltaic shading can contribute to **soil regeneration processes**. This scenario, therefore, links **energy production to landscape restoration and tourism enhancement**, positioning renewable infrastructure as a driver of environmental rehabilitation (Figure 7).

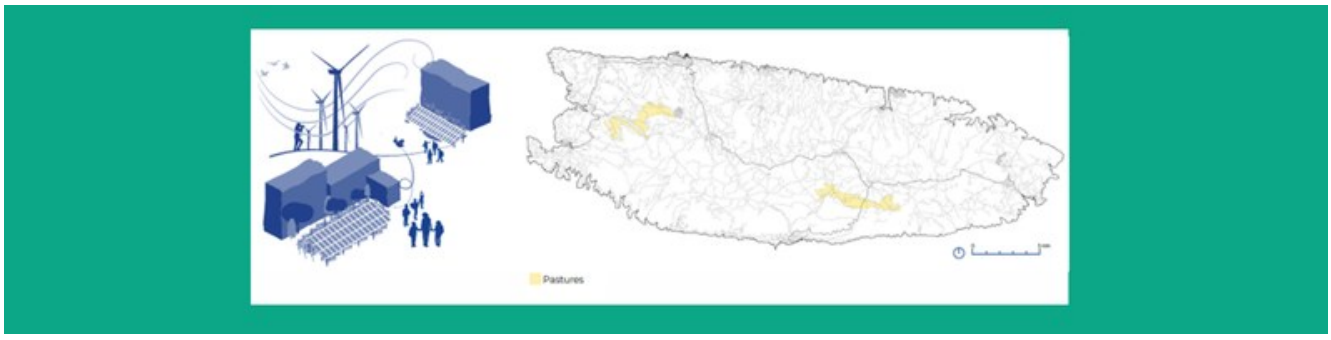

Figure 7: Wind and Habitat Regeneration scenario for Brač

Scenario 03 – Agrivoltaics for Olive and Vineyard Production

The third scenario focuses on **agrivoltaic systems integrated into olive groves and**

vineyards, particularly in areas suitable for **Protected Designation of Origin (PDO) production**. Agri-PV trackers installed between cultivation rows aim to support **climate adaptation in response to prolonged summer heat waves and hydroclimatic stress**.

Installed capacity in this model would exceed 10 MW, distributed across parcels of at least 30 hectares. This scenario combines **agricultural resilience with renewable generation**, while adopting a more **centralized subsidy structure** than the first configuration (Figure 8).

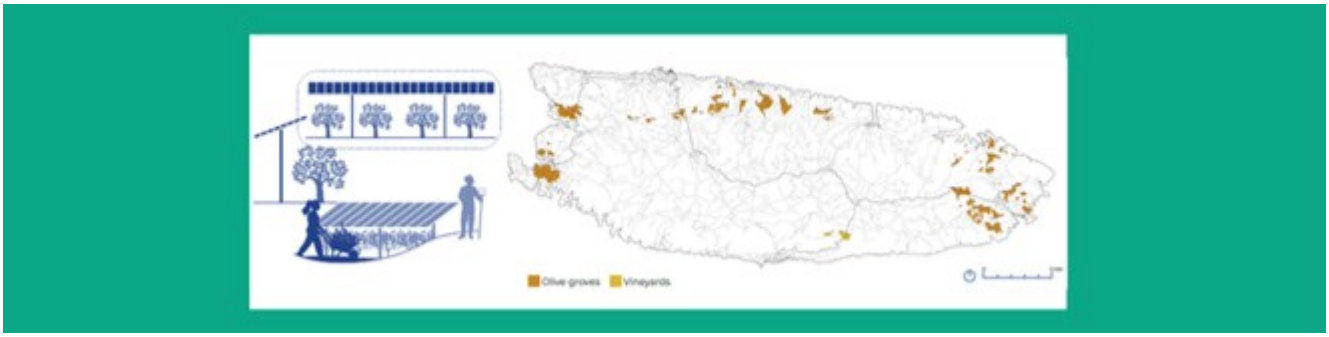

Figure 8: Agrivoltaics for Olive and Vineyard production scenarios for Brač

No single configuration was formally adopted as the definitive pathway. Instead, the landscape-based process enabled stakeholders to evaluate how different combinations of **decentralized agricultural integration and more centralized energy infrastructure** could help achieve the island's renewable capacity target.

Energy transition in Brač, therefore, emerges as a **territorially negotiated balance** between installed capacity requirements, landscape identity, ecological constraints, actor configuration, and governance models. In this sense, renewable deployment is framed not only as an **emissions-reduction strategy** but also as a **landscape-transformation process embedded within the island's cultural and environmental fabric**.

This exploration establishes the **renewable backbone of the Roadmap** while preserving flexibility in implementation pathways.

While **renewable energy deployment** constitutes the structural backbone of Brač's transition pathway, achieving **climate neutrality** also requires improving the **operational systems and services that support everyday life on the island**. For this reason, the Roadmap also explores a set of **innovation-driven solutions that address key local service and infrastructure needs**.

Innovative Solutions for the Island Transition

The **Open Innovation Cooperative Action** created a structured process that matched **operational challenges identified by local service providers** with **technological solutions proposed by European SMEs and research institutions**.

The process followed a **bottom-up approach**. During the **first round of Rooting Labs**, local stakeholders, including **municipal utilities, public authorities, and emergency services,** jointly identified a set of **operational challenges affecting the island's transition toward climate neutrality**.

These challenges were subsequently published on a **dedicated innovation platform** (https://openinnovationcolab.com/), inviting **SMEs and start-ups from across Europe** to propose potential solutions.

A total of 18 solutions were submitted, from which the **most promising proposals were selected** and then discussed with **local stakeholders and public administrations** during the **Island I Would Like Lab**.

Three priority challenges were ultimately addressed for the island of **Brač**.

Smart Waste Route Planning

The municipal waste operator identified the need for a **system to track and manage waste containers and collection vessels** across the island (Figure 9). In response, LIS Data Solutions proposed an AI-powered waste routing and monitoring system that integrates geolocation-based container identification, real-time route optimization, and digital performance monitoring.

The solution aims to reduce fuel consumption, improve logistical efficiency, enable performance-based billing, and facilitate **seasonal operational adaptation**, particularly relevant in the context of strong seasonal tourism fluctuations. By optimizing service organization rather than expanding infrastructure, this intervention strengthens **environmental performance** while improving cost control and operational coordination.

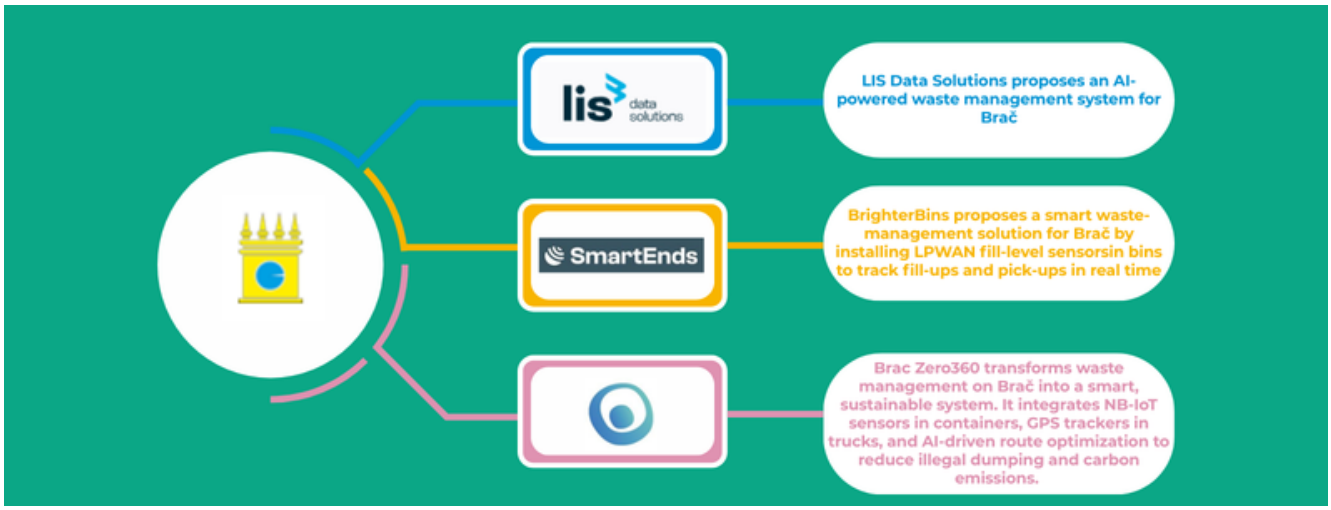

Figure 9: Alternative innovation solutions proposed by SMEs in response to the smart waste management

challenge identified for Brač through the Open Innovation Cooperative Action.

Smart Water Monitoring

The island's water utility, Vodovod Brač, highlighted chronic **water loss within the supply network as a structural vulnerability** (Figure 10). In response, the startup Fibsen proposed a **real-time fiber-optic leak-detection system combined with a digital twin of the water-supply network**.

The proposed system transforms water infrastructure into real-time monitoring network, enabling rapid leak detection and proactive maintenance. The solution is designed to reduce **non-revenue water losses (40–60%)**, lower pumping-related energy use, and strengthen reliability during peak seasonal demand. In a context marked by water scarcity pressures, this intervention reinforces **resource resilience** while improving operational sustainability.

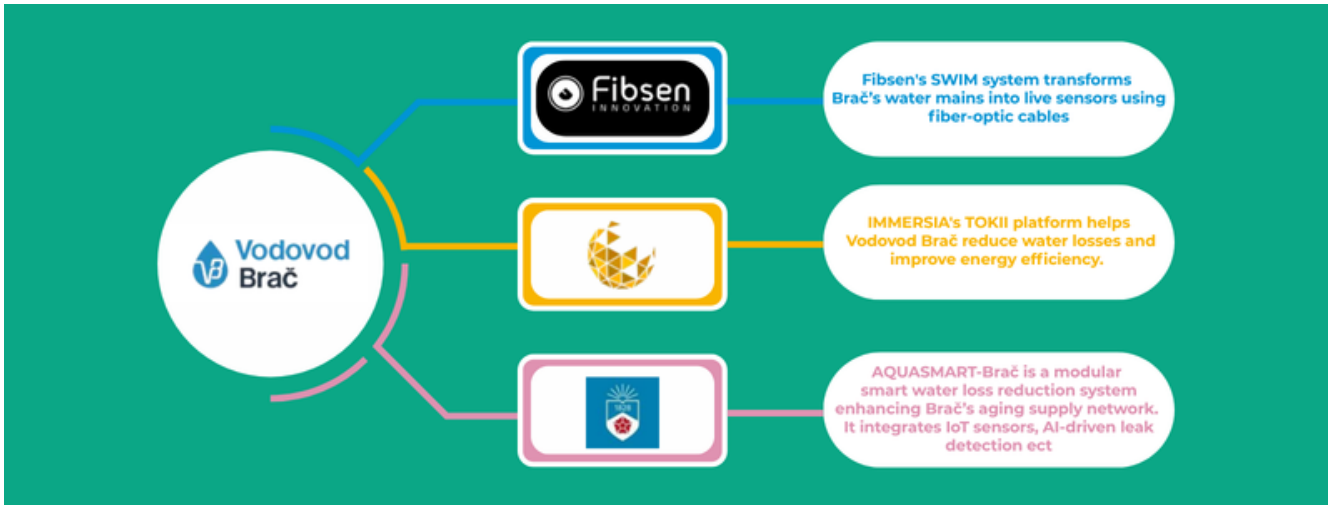

Figure 10: Innovation proposals developed in response to the smart water monitoring challenge identified by Vodovod Brač during the Open Innovation Cooperative Action.

EV Fire Safety

As the Roadmap advances **the electrification of mobility**, the local fire brigade, Firebrigade Supetar, has identified the need to strengthen preparedness for electric-vehicle incidents (Figure 11). The E-FAST Initiative, led by the University of Central Lancashire, proposes **an integrated EV fire-response and training pilot tailored for Brač**.

The initiative focuses on advanced suppression strategies, AI-supported knowledge systems, immersive training simulations, and community engagement. By reinforcing

firefighter capacity and updating safety protocols, this intervention ensures that the technological transition is accompanied by **appropriate risk management and institutional readiness**.

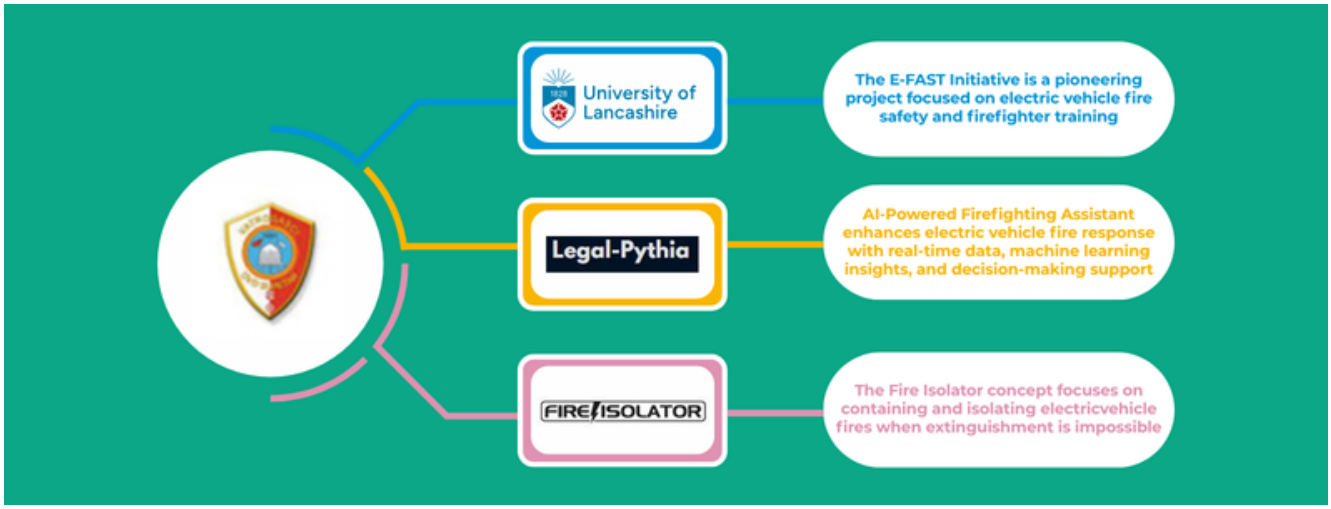

Figure 11: Innovation proposals addressing the electric-vehicle fire safety challenge identified by local emergency services during the Open Innovation Cooperative Action on Brač.

Together, these three interventions demonstrate that **carbon neutrality on Brač is not limited to emission reduction strategies alone**. It also requires modernization of operational systems, reinforcement of local service providers, and integration of **innovation into everyday infrastructure management**.

By linking public utilities, SMEs, research institutions, and emergency services within a **structured cooperation framework**, this dimension reinforces **implementation capacity** and anchors the transition in **practical, service-level improvements**.

While these **innovation solutions** address **operational infrastructures and service efficiency**, the transition process for Brač also depends on the **active involvement of local communities**. For this reason, the roadmap development process included several **participatory activities to capture citizens' perspectives, stimulate dialogue, and strengthen local ownership of the transition**.

Community Perspectives and Youth Engagement

Roadmap's successful implementation ultimately depends on the **local community's engagement and support**. For this reason, the transition roadmap for Brač also places strong emphasis on **citizens' perspectives** and **youth engagement** in shaping the island's future.

A first layer of insight was provided through a **citizen survey conducted in Supetar**, which explored residents' awareness of climate change and their willingness to support decarbonisation measures. The results revealed **a generally high level of environmental awareness and broad recognition of the need for mitigation actions**. Renewable energy and waste management emerged as the two priority areas where citizens expect the island to focus its transition efforts, confirming the alignment between community perception and the technical analysis of the island's emissions profile.

These quantitative insights were complemented by **Vox Populi interviews**, which collected spontaneous reflections from residents during *The Island I Would Like* Lab activities. The testimonies revealed a **strong attachment to the island's landscape and environmental identity**. While some participants expressed concerns about the possible visual impact of renewable infrastructures, many described a **desirable future island characterised by greater use of renewable energy, reduced car dependency, and the preservation of natural landscapes**. These reflections highlight how the **transition toward climate neutrality** is perceived not only as a technical challenge but also as an **opportunity for transformation that needs to remain compatible with the island's cultural and territorial identity**.

A central role in this engagement process was played by the **Youth Think Tank**, which brought together students from Bol High School and university students from the University of Split - Faculty of Civil Engineering, Architecture and Geodesy. The activity created a space for dialogue between different generations, combining technical expertise with the perspectives of younger residents who will directly experience the long-term consequences of climate transition choices.

University students approached the theme of carbon neutrality through **spatial and environmental analyses**, examining factors such as traffic patterns, terrain characteristics, woodland coverage, and landscape dynamics across the island. These analyses provided a data-driven basis for understanding Brač's environmental systems and helped visualise how different transition strategies could interact with the territory.

High school students contributed through discussion sessions and interactive exercises focused on the **future of their island**. When asked to identify the most effective solutions for achieving climate neutrality, students consistently prioritized **renewable energy development and sustainable mobility**, while also emphasizing the importance of **changing everyday behaviours**. Their responses reflected a growing awareness that long-term sustainability depends not only on technological solutions but also on collective lifestyle changes.

These reflections were further integrated into the broader co-creation process during "**The Island I Would Like Lab**", where citizens, students, experts, and local stakeholders worked together to explore possible transition visions for Brač. Through group discussions and interactive simulations, participants evaluated different decarbonisation strategies, combining technical evidence with local knowledge and practical considerations related to

feasibility and territorial compatibility.

To support this dialogue, the participatory process was also supported by **immersive 3D visualisation tools** that allowed participants to explore renewable energy scenarios within a realistic reconstruction of the Brač landscape. By enabling stakeholders to observe potential installations from different spatial perspectives, **the visualisation facilitated more informed discussions on landscape integration and the territorial implications of the proposed transition strategies**.

In this way, the **transition pathway for Brač emerges not only from analytical modelling and spatial planning but also from the perspectives and aspirations expressed by its citizens, stakeholders, and younger generations**.

These **participatory activities** also fed directly into the **identification of concrete transition priorities for the island**. Through **The Island I Would Like Lab**, stakeholders translated community perspectives and analytical insights into a set of policy options and strategic actions to support Brač's pathway toward **climate neutrality**.

Co-created Transition Priorities

The transition pathway for Brač was not defined exclusively through **technical analysis**, but was progressively shaped through a **structured co-creation process involving local stakeholders**. The **Island I Would Like Lab** represented the moment in which **analytical evidence**, **territorial knowledge**, and **community perspectives** converged to identify **concrete transition priorities for the island**.

During the **Island I Would Like Lab**, participants interacted with the **CO2 PACMAN Tool** to explore and assess a range of **policy options to reduce greenhouse gas emissions and support Brač's pathway toward climate neutrality**. The tool enabled stakeholders to **simulate the effects of different policy combinations on the island's greenhouse gas balance** and to evaluate their relevance to the island's territorial, spatial, and socio-economic conditions, across sectors including **energy, transport, residential efficiency, waste management, agriculture, and industrial processes**.

The collective evaluation produced a clear pattern of policy selection. Out of **28 policy options, 17 were consistently selected**, while **10 were excluded at least once** during the simulations and **one option was never selected**. The policies most frequently retained focused on **energy systems, mobility, residential efficiency, waste management, and sustainable agriculture**, reflecting the areas stakeholders perceived as most relevant and feasible within Brač's territorial context (Figure 12).

Among the mobility-related measures, **the electrification of maritime transport emerged** as a particularly relevant option within the **island's transition path**. As highlighted in the assessment phase, Brač is already relatively close to climate neutrality on a net basis, and the scenario discussions showed **that interventions in the maritime sector** could play a

decisive role in addressing the remaining emissions gap. In particular, replacing two conventional ferries currently serving the island with **electric alternatives** would be sufficient to exceed the remaining emissions balance. This option attracted strong interest among participants, who widely recognised **its potential impact and compatibility with the island's territorial context**. At the same time, its implementation ultimately depends on **investment decisions taken by private ferry operators** and higher-level transport authorities. This type of investment/projects could be supported by EU programmes like Life+ or similar. **This example illustrates how the co-creation process helped identify concrete sectoral interventions capable of strengthening Brač pathway toward climate neutrality**.

The analysis of excluded measures revealed that **large-scale renewable energy infrastructure, particularly offshore wind and marine energy solutions, was the option** most frequently set aside by participants. By contrast, policies related to **energy efficiency, behavioural change, and distributed technologies** were consistently selected across the scenarios developed by the different stakeholder groups. **This distribution highlights how stakeholder discussions tended to converge on measures perceived as more compatible with the island's territorial characteristics and implementation capacity.**

Following the individual simulations, a **joint co-creation session** was organised to compare results and explore potential convergence among participants. During this dialectic phase, **several initial positions emerged through dialogue, prompting** reconsideration of some measures previously excluded in the individual scenarios. In particular, some measures initially excluded by individual groups - including **industrial process optimisation, micro-wind deployment, and field-mounted photovoltaic generation** - were reconsidered and incorporated into the jointly defined scenario.

At the same time, other options that had already received limited support - including **large-scale wind deployment, marine energy solutions, increased use of electric trucks, and tree plantation measures** - remained excluded after collective discussion. The persistence of these exclusions indicates that participants ultimately converged on **prioritising other mitigation options within the available policy portfolio**.

Overall, this iterative process highlights the **added value of combining individual scenario simulations with a subsequent co-creation phase**. While the initial exercises captured the diversity of perspectives across stakeholder groups, the collective discussion enabled participants to **reassess certain options and progressively converge toward a more coherent set of transition priorities**. From a roadmap development perspective, this step illustrates how **participatory tools can support the progressive refinement of decarbonisation strategies through dialogue, negotiation, and shared learning among local stakeholders**.

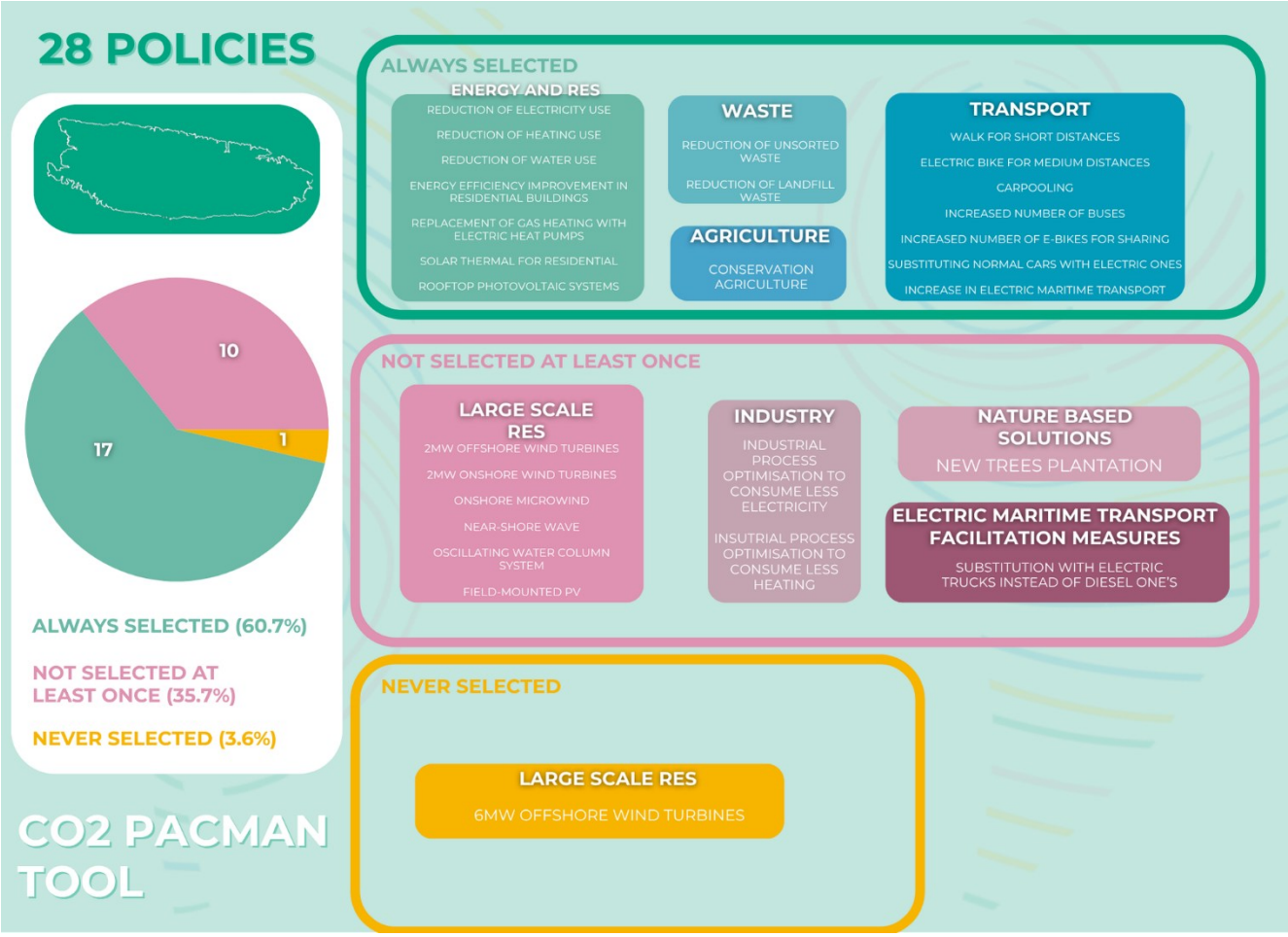

Figure 12: Policy prioritisation emerging from the Island I Would Like Lab, highlighting measures consistently selected by stakeholders, options excluded at least once during the simulations, and the single policy never selected

These priorities reflect the interaction between **quantitative scenario modelling and stakeholder deliberation**. While renewable energy deployment constitutes the structural backbone of the transition, the prominence of shared mobility solutions highlights the importance of behavioural and organisational changes alongside technological interventions.

In particular, the expansion of **e-bike sharing systems** was identified as highly compatible with the island's territorial scale and short-distance mobility patterns, offering a practical alternative to private car use. **Carpooling practices**, similarly, were considered a feasible and immediately implementable measure capable of reducing fuel consumption and traffic intensity without requiring major infrastructure investments.

The emergence of these priorities illustrates how **The Island I Would Like Lab** functioned as a **decision-support environment**, in which **analytical tools, local knowledge, and**

stakeholder perspectives converged to define **realistic, territorially grounded transition directions.** Rather than prescribing a rigid set of measures, the co-creation process enabled participants to collectively evaluate how different actions could contribute to the island's pathway toward climate neutrality.

Together, these **co-created priorities** complement the structural renewable energy strategies, reinforcing the Roadmap's integrated approach in which **technological deployment, mobility practices, and collective behavioural shifts** jointly contribute to the transition.

While these participatory activities reveal the **collective vision emerging from the island community**, the practical implementation of the transition ultimately depends on the ability to mobilise **financial resources and align them with concrete projects**.

Financing Pathways and Implementation Capacity

Translating the transition priorities identified for Brač into concrete actions requires not only technological feasibility and social support, but also the **mobilisation of adequate financial resources and implementation capacity**. For this reason, the island's territorial transition process also considers the alignment between the solutions emerging from the participatory process and the financial instruments that can support their realisation.

Mediterranean islands face specific financial constraints when pursuing climate neutrality. Geographic isolation, small-scale energy systems, seasonal economic fluctuations, and limited administrative capacity often increase the cost and complexity of investments. In this context, the transition cannot rely on a single funding source but requires a **combination of complementary financial instruments** to support different phases of project development.

The financial landscape relevant to Brač, therefore, reflects a **multi-layered funding ecosystem**, combining **European programmes, national recovery instruments, and innovative financing mechanisms**. European programmes can primarily support the **innovation and preparation phases of the transition**, financing technological development, feasibility studies, and pilot experimentation that help transform emerging ideas into mature investment projects.

However, the large-scale deployment of infrastructure - including **renewable energy installations, sustainable mobility systems, and advanced waste management solutions** - typically depends on **national recovery funds, cohesion policy instruments, and dedicated investment facilities**, which provide the capital required for the implementation of mature projects.

In the Croatian context, this includes instruments such as the **Recovery and Resilience**

Facility (RRF), **EU Cohesion Policy funds**, and financing provided through the **European Investment Bank (EIB)**, which play a key role in supporting large-scale investments in energy infrastructure, sustainable mobility, and environmental services.

For Brač, the transition strategy relies on a **blended-finance approach, combining grants, loans, and technical assistance** to reduce investment risk and make projects financially viable. This approach allows different funding sources to complement each other: **European programmes supporting innovation and project preparation**, **national instruments enabling infrastructure deployment**, and **investment facilities facilitating access to capital for large-scale projects**.

Beyond public funding, innovative financial mechanisms may also help strengthen local implementation capacity. Instruments such as **community investment schemes, crowdfunding platforms, and blended finance structures** can help attract additional private capital while increasing **local ownership** of transition projects. In island contexts, these mechanisms can contribute not only to financial feasibility but also to strengthening the **social legitimacy of infrastructure investments**.

From this perspective, the Roadmap not only identifies technical solutions but also highlights the **financial and institutional conditions required for their implementation**. By aligning transition priorities with available funding mechanisms, Brač's pathway toward climate neutrality becomes not only **technically grounded and socially supported** but also **financially anchored and operationally implementable**.

Taken together, these **five interconnected dimensions** define **Brač's integrated pathway toward climate neutrality**: **renewable energy strategies**, **island service innovation, community-driven priorities, participatory governance, and financial implementation pathways. Together, they provide a coherent framework for creating and implementing a Roadmap for the island's transition in a realistic, territorially rooted manner** (Figure 13).

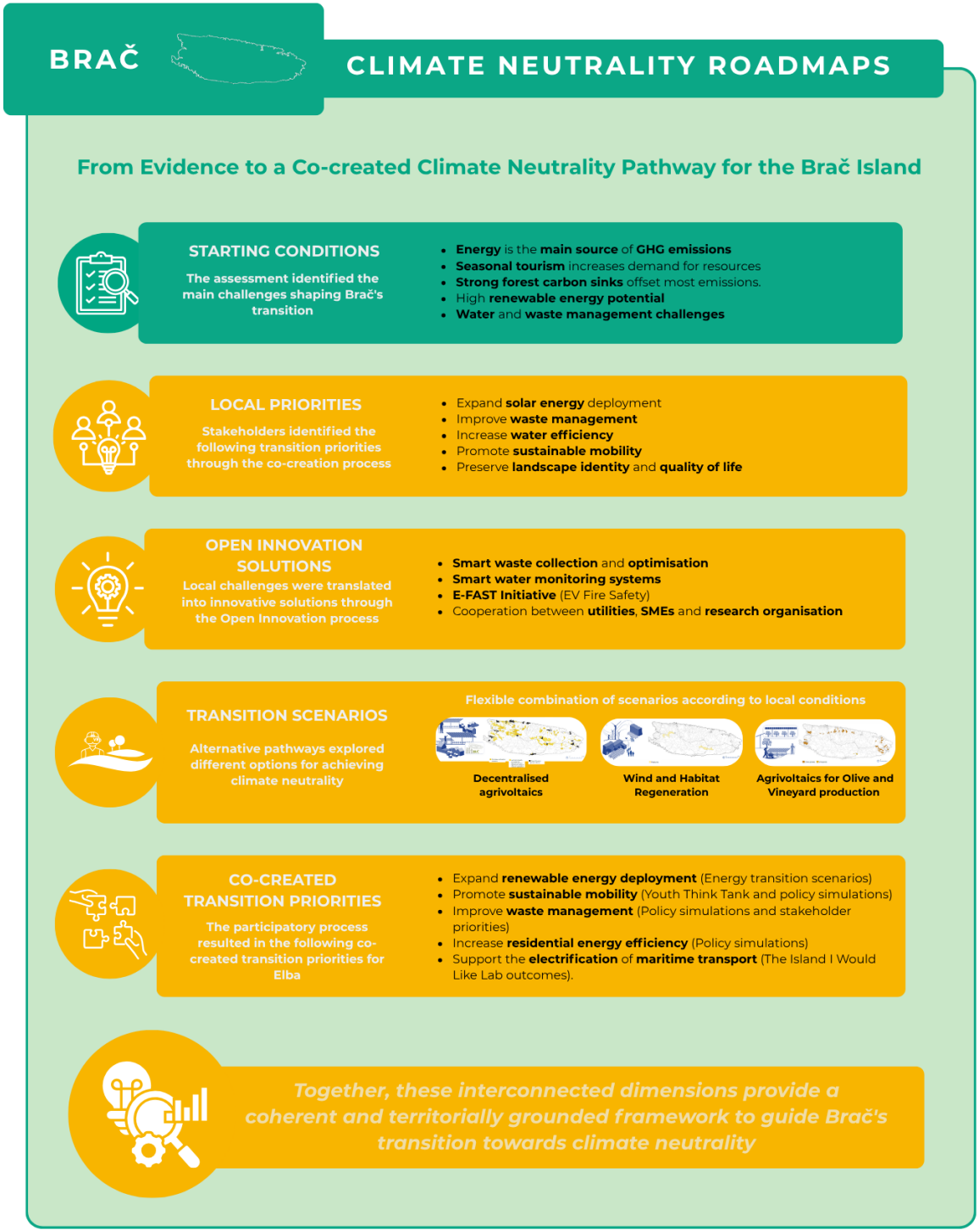

Figure 13: Climate Neutrality Roadmap at a Glance for Brač.
Summary of the co-created transition pathway, illustrating how technical evidence, stakeholder engagement, open innovation and scenario development contributed to the definition of shared transition priorities.

Elba – Climate Neutrality Transition Roadmap

The Climate Neutrality Transition Roadmap for Elba brings together the outcomes of the co-creation process developed throughout the project, translating analytical work and stakeholder exchange into a structured pathway towards climate neutrality for the island.

Following the assessment phase, which provided a clear understanding of the island's emission profile and structural characteristics, the focus shifted from understanding "where Elba stands" to outlining its pathway towards climate neutrality. This phase marked a transition from analysis to action, developed through an iterative process combining quantitative evidence, stakeholder engagement, spatial exploration, and policy-oriented discussions.

Rather than presenting a predefined set of sectoral measures, the Roadmap integrates technical evidence, territorial knowledge, and stakeholder perspectives to identify feasible, context-specific transition directions. Scenario exploration and participatory dialogue, supported by spatial visualisation tools, enabled stakeholders to assess how different technological and policy options could interact with the island's environmental and socio-economic context.

In this sense, the Roadmap does not simply list mitigation measures. It structures a coherent transition pathway that connects analytical insights, local priorities, and spatial considerations, outlining a possible trajectory towards a climate-neutral future for Elba, as shaped through the participatory process (Figure 14).

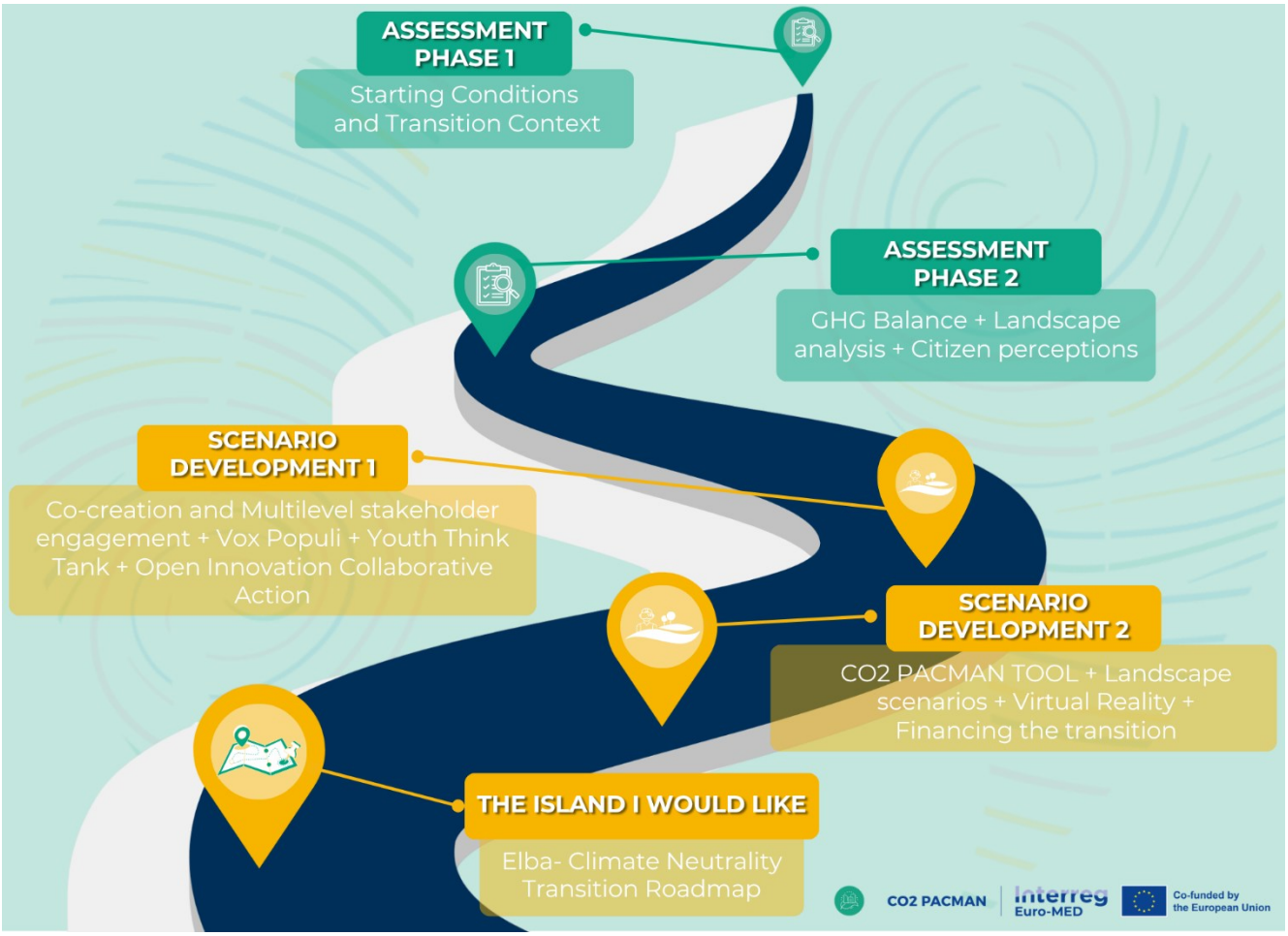

Figure 14: Conceptual pathway guiding the development of the Climate Neutrality Transition Roadmap for Elba

Starting Conditions and Transition Context

The Climate Neutrality Transition Roadmap for Elba builds on a comprehensive understanding of the island's **greenhouse gas profile**, its **territorial characteristics**, and its **stakeholder dynamics**.

The assessment phase highlights the predominance of the **Energy sector**, accounting for approximately 93% of gross emissions (183.2 kt CO_2eq). This reflects the island's emissions profile, in which energy-related consumption patterns are the main source of emissions, particularly from **mobility** and electricity use. The **Waste sector** accounts for around 5% of emissions (9.5 kt CO_2eq), while the **AFOLU sector** accounts for approximately 2% (4.5 kt CO_2eq). The **Industrial Processes sector** accounts for 0 kt CO_2eq in the CO2 PACMAN assessment framework, since the IPCC methodology includes only process emissions from mineral, chemical, and metal production activities, which are absent in Elba. Emissions associated with the energy use in all sectors are accounted for within the Energy sector

(energy consumption).

Overall, gross emissions amount to approximately 197 kt CO_2eq. Thanks to existing **natural carbon sinks**, around 32% of these emissions are compensated, resulting in net emissions of approximately 135 kt CO_2eq. This configuration indicates that Elba is not close to climate neutrality on a net basis. At the same time, it highlights the central role of **energy-related mitigation pathways** in the island's transition process.

Beyond the quantitative profile, the territorial and socio-economic context further shapes the direction of the transition. The process was initiated through the **Rooting Lab**, which engaged a wide range of stakeholders, including local and regional authorities, national agencies, sectoral organisations, SMEs, infrastructure and service providers, NGOs, interest groups, and the general public. Through technical exchanges, participatory activities, and stakeholder dialogue, participants helped interpret the island's baseline conditions and identify strengths and constraints relevant to the transition process.

Through a structured SWOT analysis, stakeholders identified key strengths, weaknesses, opportunities, and threats shaping Elba's transition pathway. Among the main strengths identified were natural carbon sinks, significant renewable energy potential, the National Park, relatively low population density, a strong waste management system, and tourism revenues. At the same time, the SWOT analysis highlighted several weaknesses, including a high reliance on **fossil fuels** for energy and mobility, weak sustainable mobility infrastructure, limited integration of renewable energy, an ageing population and net emigration, and gaps in policy and coordination.

The SWOT analysis also identified a set of threats and opportunities relevant to the island's transition context. Reported threats include **climate change impacts**; delays in policy implementation and bureaucratic barriers; resistance to change; lack of public awareness; economic and social disruptions from the green transition; and tourism-driven seasonal demand peaks. At the same time, stakeholders identified several opportunities, including **the electrification of transport and ports, the expansion of renewable energy**, EU funding and policy support, ecotourism and green business models, the creation of **renewable energy communities**, and innovation in the **circular economy** and water management. Together, these findings suggest that Elba's transition challenge is shaped not only by technological and infrastructural constraints but also by governance capacity, public acceptance, and the island's strong dependence on seasonal tourism.

In parallel, the AskyourcitizenonCaN survey revealed strong environmental awareness among residents: 89% of respondents reported awareness of climate change, and 76% considered it necessary to adopt adequate mitigation measures. However, only 37% of respondents are optimistic that the island will achieve climate neutrality by 2040. Citizens identified transportation (72%) and renewable energy (67%) as priority areas, followed by waste management (53%), energy efficiency in buildings (33%), and sustainable agriculture and forestry (17%). These findings demonstrate a significant alignment between the **technical assessment** and **community perception**, particularly regarding the central

role of energy and mobility in the island's transition. Survey results show that **most respondents (65%) expressed a preference for maintaining current landscape conditions**, while 31% supported change under specific conditions and 4% were indifferent. This highlights the importance of landscape considerations in shaping the island's transition process, particularly regarding the acceptance of landscape transformations and the role of participatory and visualisation tools in supporting informed decision-making.

Early stakeholder exchanges further highlighted the importance of strengthening cooperation with regional actors, improving coordination across governance levels, and supporting community engagement in the transition process. The Rooting Lab also contributed to consolidating new connections with local initiatives, including the REC of Elba. It confirmed the value of combining technical dialogue with more accessible outreach and participatory formats. These elements helped shape the **strategic orientation of the Roadmap**, ensuring it reflects priorities emerging from the island's socio-economic and environmental context.

Taken together, Elba's starting conditions reveal a territory with relevant environmental assets and an active stakeholder environment, yet exposed to structural constraints linked to energy dependency, mobility, and seasonal pressures. These conditions provide the starting point for defining the island's transition pathway (Figure 15).

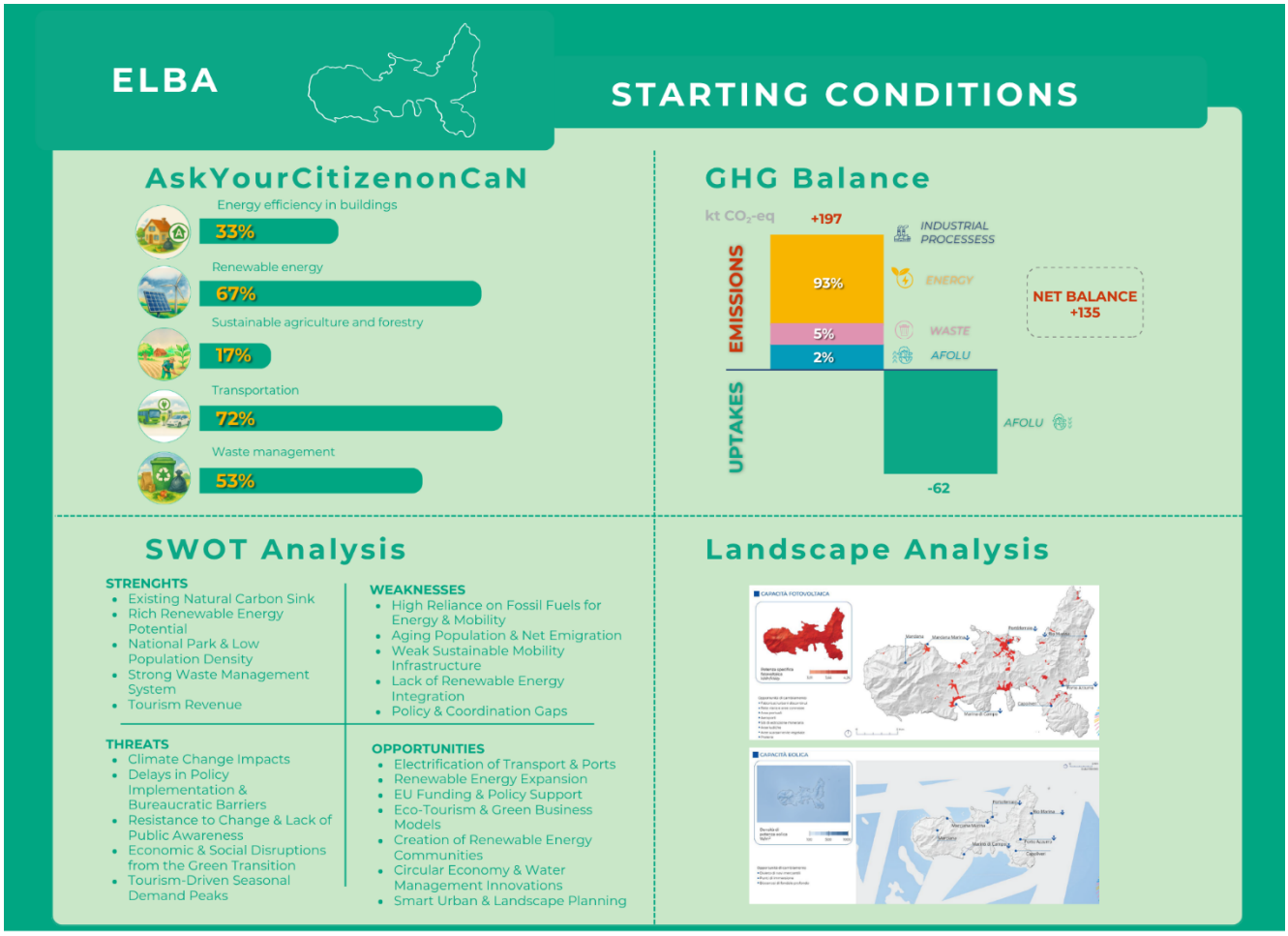

Figure 15: Overview of Elba's starting conditions: presenting greenhouse gas balance assessment, territorial and SWOT analysis, and citizen perception insights collected during the Rooting Lab.

The Climate Neutrality Transition Roadmap, therefore, translates these insights into a **structured territorial transition process** for Elba, aligning **technical analysis**, **territorial conditions**, and **community priorities** to guide the island's long-term climate transition.

Elba Integrated Pathway to Climate Neutrality

The transition pathway for Elba is structured around five interconnected dimensions: **technical analysis**, **landscape-based planning**, **stakeholder engagement**, **innovation-driven solutions**, and **financial feasibility,** which together provide a **flexible framework** for guiding the island's transition towards climate neutrality.

Building on the results of the participatory process conducted through the CO2 PACMAN Labs, the pathway translates **analytical evidence** and **community perspectives** into a

coherent, tailored transition framework for the island.

Rather than defining a single predefined trajectory, the Roadmap integrates these components to support a **flexible transition towards climate neutrality**.

Energy & Landscape Transformation

Renewable energy development constitutes the core component of Elba's pathway toward climate neutrality. Based on the greenhouse gas balance, achieving carbon neutrality requires installing approximately 22.5 MW of additional renewable energy capacity, representing a substantial increase in local energy production.

In Elba, renewable energy integration was not treated as a purely technical planning task but addressed through a **landscape-based process** that combined spatial analysis, scenario development, and design exploration.

This approach connects **energy planning with the island's territorial characteristics and local identity**, ensuring that transition strategies remain understandable, participatory, and open to discussion among stakeholders and citizens.

To support this process, **immersive visualisation tools**, including virtual reality (VR) simulations, were used to translate complex spatial analyses into intuitive and interactive experiences. The VR environment allowed participants to explore renewable energy scenarios at a human scale and from multiple viewpoints, helping them better understand spatial relationships, visual impacts, and how new infrastructure may fit within the landscape.

This experiential approach fostered more informed discussions and strengthened the connection between technical planning and public perception (Figure 16).

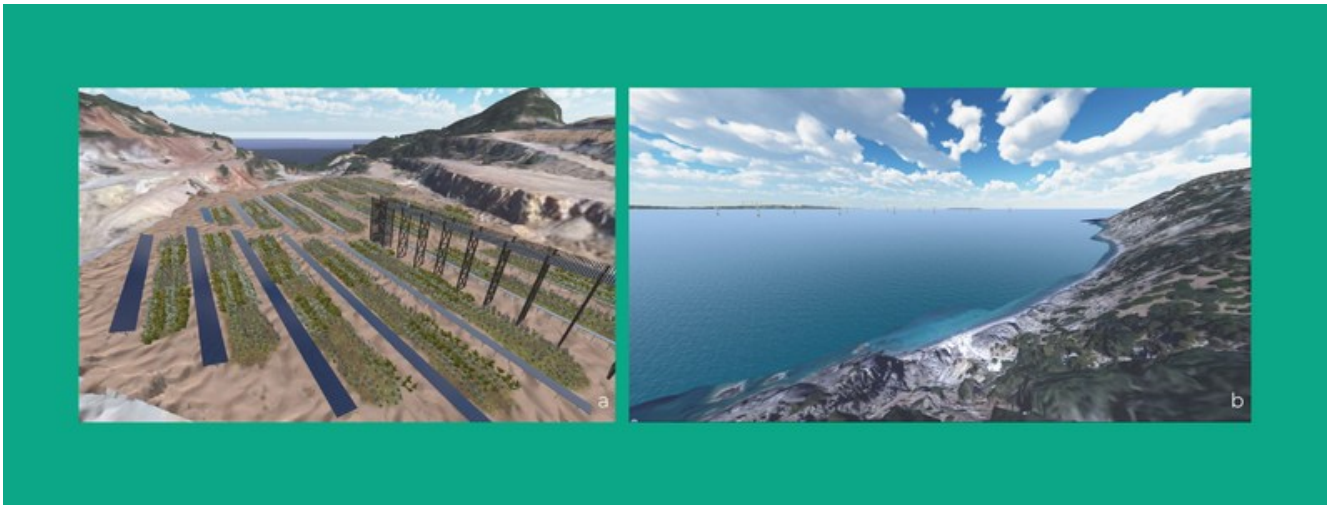

Figure 16: Immersive visualisation of renewable energy scenarios in Elba. (a) Photovoltaic integration within post-mining landscapes; (b) offshore wind installations as perceived from the coastal environment.

Building on this process, **three integrated and interchangeable perspectives** were developed, reflecting different ways of combining renewable energy deployment with the island's environmental and socio-economic context.

Scenario 01 – Offshore Wind Development

This scenario explores concentrating renewable energy production in offshore wind farms to reduce the need for extensive onshore installations (Figure 17). While technically feasible, this model requires substantial investment and relies on robust financial support mechanisms. It represents a more centralised approach to energy production, with implications for visibility and landscape perception.

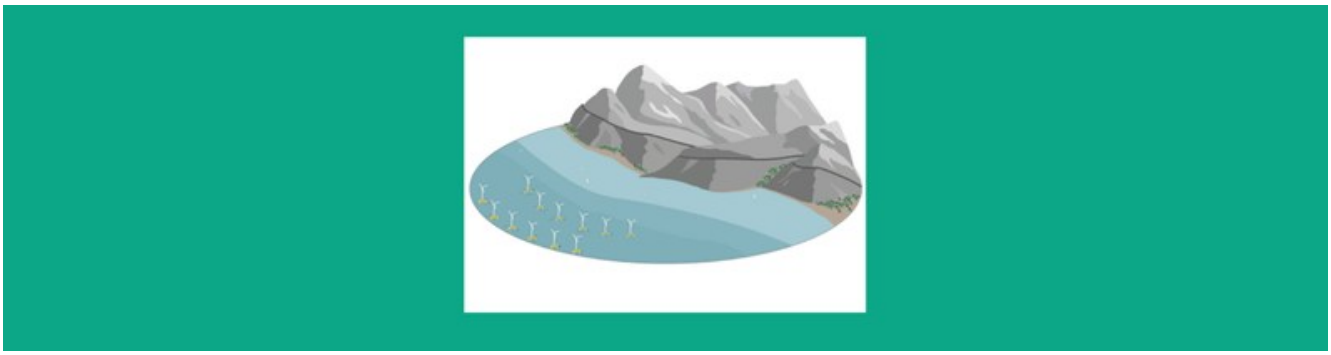

Figure 17: Offshore wind scenario for Elba, illustrating the potential configuration of wind turbines in the marine environment and their visibility from the coastal landscape.

Scenario 02 – Solar Energy and Landscape Regeneration

The second scenario integrates photovoltaic systems into former mining areas, combining renewable energy generation with environmental restoration (Figure 18). In this model, energy generation contributes to the regeneration of degraded landscapes, linking decarbonisation objectives with ecological recovery and territorial reuse.

Figure 18: Solar energy and landscape regeneration scenario for Elba, illustrating the integration of photovoltaic systems within former mining areas and their connection with the surrounding territory.

Scenario 03 – Agrivoltaics and Local Production Systems

The third scenario focuses on integrating agrivoltaic systems into agricultural areas, particularly on abandoned or underutilised land (Figure 19). This approach supports the recovery of traditional crops, strengthens local production systems, and creates additional income opportunities through renewable energy generation.

Figure 19: Agrivoltaic scenario for Elba, illustrating the integration of photovoltaic systems within agricultural areas and their interaction with local ecosystems, community spaces, and productive landscapes.

No single configuration was identified as the definitive pathway. Instead, **the process allowed stakeholders to assess how different options could contribute to the island's renewable energy objectives and to reflect on their compatibility with local conditions**.

In Elba, the transition towards renewable energy is therefore shaped by the need to integrate technical solutions within a **sensitive territorial context**, where landscape quality, environmental constraints, and local activities play a central role. Rather than converging on a single model, the **process highlights the importance of adapting energy strategies to the island's specific characteristics**.

In this perspective, renewable energy development becomes part of a broader

transformation process in which **spatial, environmental, and social dimensions** are closely interconnected. This approach provides a structured basis for guiding future decisions while leaving room for gradual implementation and context-specific adjustments.

Beyond **renewable-energy strategies and territorial regeneration**, the transition pathway for Elba also focuses on the capacity of local actors to experiment with innovative responses to island-specific challenges. From this perspective, the Roadmap includes a set of **open-innovation solutions** that address sustainable tourism activities, agroecological practices, and low-carbon mobility systems.

Innovative Solutions for the Island Transition

The **Open Innovation Cooperative Action** supported the identification of practical solutions addressing some of the transition challenges emerging from the participatory process developed on the island.

Following the first round of **Rooting Labs**, local stakeholders identified a set of operational and territorial challenges linked to Elba's pathway toward climate neutrality. These challenges focused particularly on **sustainable events and tourism-related activities, agroecological innovation, and low-carbon mobility solutions**.

The identified challenges were subsequently published on the **CO2 PACMAN Open Innovation platform** (http://www.innovationcolab.eu), inviting SMEs, start-ups, and research institutions from across Europe to propose possible solutions. Overall, 20 solutions were submitted for the island of Elba. A first screening process conducted with local stakeholders and technical committees led to the selection of the most relevant proposals, which were later discussed at the **Business Forum in Valencia** and in the second round of Labs in Elba (**The Island I Would Like**).

For the island of Elba, **three priority challenges were addressed**.

Sustainable Events and Carbon Neutrality

Fondazione Acqua dell'Elba identified the need to improve the environmental sustainability of events and tourism-related activities on the island (Figure 20). In response, **Bluease** proposed a digital platform for sustainable and low-carbon event management, designed to support the monitoring and reduction of emissions associated with event organisation and visitor activities.

The proposed solution supports the development of **more sustainable tourism practices by combining digital monitoring tools with low-carbon event management strategies**. In a context where tourism is a central component of the island economy, the initiative

helps link climate transition objectives to sustainable destination management. By improving the monitoring and management of event-related emissions, the solution helps reduce the carbon footprint of one of the island's most important economic sectors.

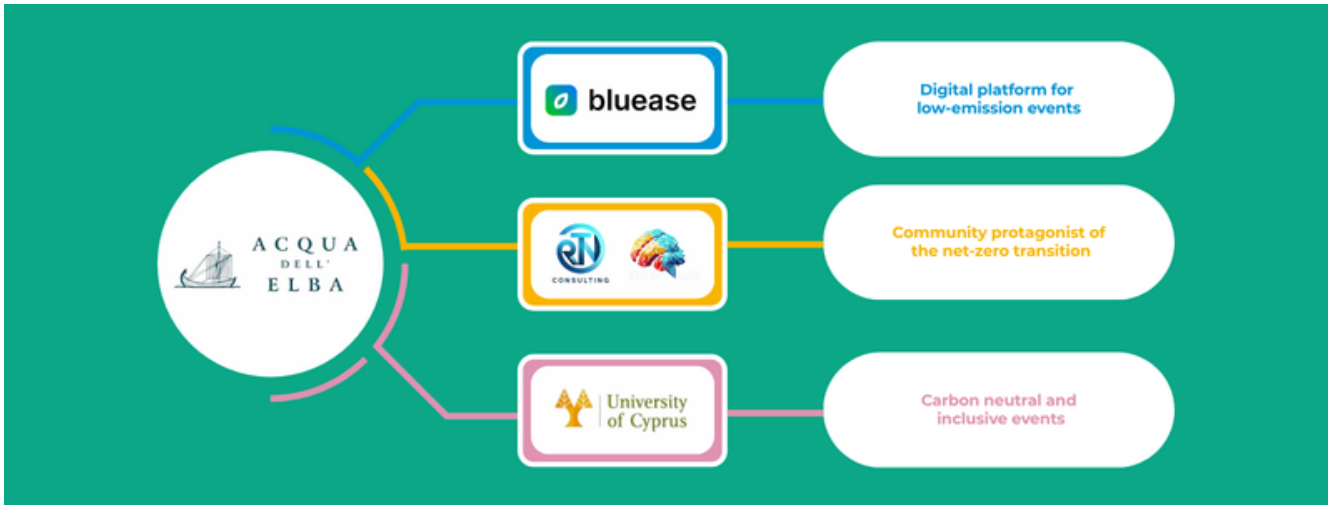

Figure 20: Innovation proposals developed in response to the sustainable events and tourism-related activities challenge identified by Fondazione Acqua dell'Elba during the Open Innovation Cooperative Action.

Agroecology and Vineyard-Forest Integration

Arrighi Winery identified the need to strengthen the ecological resilience of vineyard systems by improving the integration of agricultural production with surrounding natural ecosystems (Figure 21). In response, **EURECAT** proposed **DEVINE**, a smart monitoring and decision-support solution supporting vineyard-forest integration.

The solution aims to support agroecological management practices by **combining environmental monitoring with data-driven decision support**. By strengthening the interaction between productive landscapes and ecological functions, the intervention contributes to climate adaptation, landscape resilience, and the long-term sustainability of local agricultural systems. Although its mitigation potential is indirect, the solution supports long-term ecosystem resilience and sustainable land management, both of which are important enabling conditions for climate neutrality.

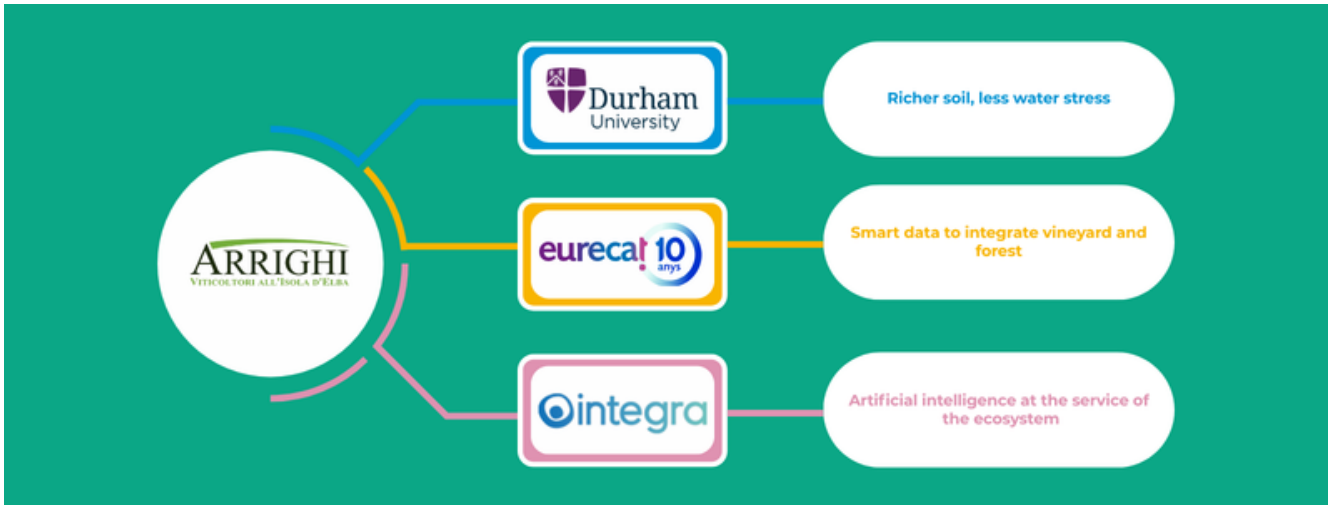

Figure 21: Innovation proposals developed in response to the agroecological resilience challenge identified by Arrighi Winery during the Open Innovation Cooperative Action.

Sustainable Mobility and Renewable Energy Integration

The **Renewable Energy Community REC Elba** highlighted the need to reduce vehicular traffic and to strengthen sustainable mobility solutions aligned with the island's energy transition (Figure 22). In response, a multidisciplinary team of the **University of Cyprus** proposed **GreenShift Elba**, an initiative aimed at transforming mobility and tourism on the island by integrating hydrogen-powered ferries, electric buses, and active mobility options to reduce emissions and congestion, while fostering sustainable, inclusive, and eco-conscious tourism.

The proposed interventions aim to reduce **mobility-related emissions** while supporting the integration of **renewable energy** within the island transport system. By linking **mobility innovation** to the broader decarbonization pathway, the initiative helps explore **alternative transport models** adapted to island contexts and seasonal tourism pressures.

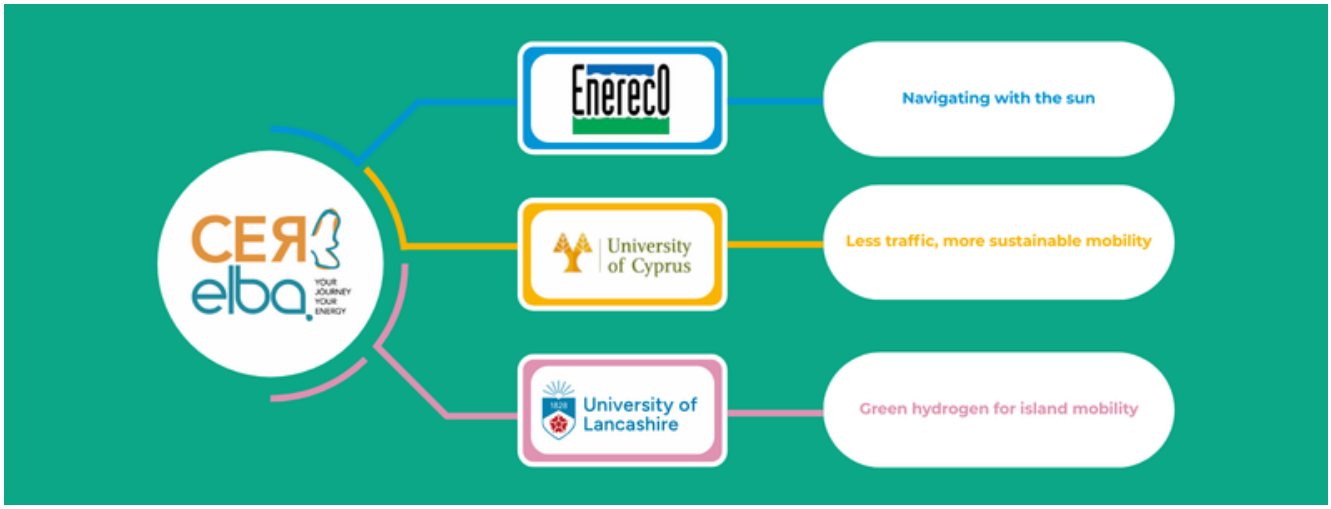

Figure 22: Innovation proposals developed in response to the sustainable mobility challenge identified by CER Elba (REC Elba) during the Open Innovation Cooperative Action.

Together, these three interventions demonstrate that Elba's transition extends beyond **emission reduction** alone. It also involves innovation in **tourism management, agroecological resilience, and sustainable mobility systems**, connecting local operational needs with broader climate-transition objectives.

By linking **local stakeholders, SMEs, research institutions, and innovation actors** within a structured cooperation framework, the Open Innovation process strengthened **implementation capacity** and supported the identification of **practical and territorially adapted transition solutions** for the island.

The Open Innovation activities also highlighted the importance of **collaboration, knowledge exchange, and openness to external expertise** within island transition processes. During the discussions, local stakeholders and challengers repeatedly emphasized that innovation was perceived not as a replacement for local identity and traditions, but rather as an opportunity to combine existing territorial knowledge with new ideas, technologies, and international partnerships. Several participants described **Elba as a potential "laboratory" for experimentation and sustainable innovation**, underlining the value of connecting local actors with startups, research centres, and external solution providers capable of contributing to the island's transition challenges. These reflections reinforced the perception of Open Innovation not only as a mechanism for identifying technical solutions but also as a process that strengthens dialogue, cooperation, and long-term territorial learning.

While these **innovation-oriented interventions** address operational challenges and support the development of more sustainable local systems, the transition pathway for Elba

also relies on the active involvement of **citizens, local stakeholders, and younger generations**. For this reason, the roadmap development process included a series of **participatory activities** to collect community perspectives, encourage dialogue, and **strengthen shared ownership of the island's climate transition**.

Community Perspectives and Youth Engagement

The transition pathway for Elba was supported by participatory processes that connected technical analysis, local knowledge, and community perspectives. Alongside the analytical and scenario-development activities, the roadmap development process actively involved **citizens, students, public authorities, local associations, SMEs, and technical stakeholders** through surveys, co-design activities, and participatory laboratories.

A first layer of insight was provided through the **AskyourcitizenonCaN survey**, conducted in Portoferraio between February and June 2025 as part of the project's "Willingness to Change" activities. The survey explored citizens' awareness of climate change, perceptions of climate neutrality, and willingness to support decarbonization measures. The results revealed a generally high level of environmental awareness and broad recognition of the importance of climate neutrality objectives for the island. **Transport, renewable energy, and waste management** emerged as the main priorities identified by citizens, confirming the relevance of these sectors within the island's transition pathway. At the same time, the survey highlighted the strong importance placed on **landscape preservation**, with many respondents considering the island's landscape a key territorial asset that should remain compatible with future transition measures. The results also revealed a gap between awareness and active participation, underscoring the need for more accessible, engaging participatory formats that can strengthen long-term community involvement in the transition process.

These quantitative insights were complemented by **Vox Populi interviews**, which collected spontaneous reflections from citizens during **The Island I Would Like Lab** activities. The testimonies revealed broad recognition of the importance of renewable energy and climate action, as well as a strong attachment to the island's environmental and landscape identity. While some participants acknowledged that renewable-energy infrastructures may inevitably alter parts of the landscape, many stressed the importance of ensuring that this transformation remains compatible with the island's ecological and cultural character. Several interviewees described a desirable future island characterised by stronger integration between people and nature, greater use of renewable energy, improved electric and collective mobility systems, and the preservation of green and natural areas. These reflections highlight how the transition toward climate neutrality is perceived not only as a technical challenge but also as a broader transformation that must balance environmental objectives, quality of life, tourism dynamics, and landscape protection.

These perspectives were further integrated and expanded during **The Island I Would Like Lab - Elba**, a three-day participatory process designed to translate previous Rooting Lab activities, citizen engagement processes, and technical analyses into a shared vision for climate neutrality. The Lab combined **immersive experiences, thematic stations, interactive discussions, and co-design activities** involving citizens, students, institutions, NGOs, SMEs, researchers, and public authorities. Participants explored the island's greenhouse gas balance, landscape scenarios, virtual-reality visualizations, and the **CO2 PACMAN Tool**, thereby making technical information and planning scenarios more accessible and directly connected to local perceptions and territorial realities.

A central component of this engagement pathway was the **Youth Think Tank**, developed together with students from the **ISIS Raffaello Foresi High School in Portoferraio**. The process evolved progressively from awareness-building activities toward direct participation in scenario development and co-design. Initial workshops focused on **climate change, decarbonization, and landscape perception**, encouraging critical thinking and emotional engagement with climate-related challenges. Subsequent activities introduced **participatory and game-based learning approaches**, allowing students to reflect on ecosystem limits, collective responsibility, and the complexity of sustainability transitions. The pathway then advanced toward the use of the **CO2 PACMAN Tool**, through which students worked with real emissions data and explored different decarbonization strategies, discussing feasibility, territorial impacts, and social acceptance.

The final phase of the Youth Think Tank took place during **The Island I Would Like Lab**, where students actively co-designed climate neutrality scenarios for Elba. The proposals developed addressed locally relevant challenges, including **the decarbonization of maritime transport, carbon capture solutions for port areas, and the restoration and sustainable management of Posidonia oceanica ecosystems**. Through these activities, students demonstrated the capacity to combine **technological, environmental, and social dimensions** within integrated transition visions, reinforcing the role of younger generations as active contributors to the island's climate transition process.

Overall, the participatory activities developed on Elba demonstrate that the transition toward climate neutrality is not approached solely as a **technical challenge.** Instead, the roadmap emerges from a broader collective process that integrates **scientific evidence, territorial knowledge, institutional perspectives, and community aspirations** into a shared and place-based vision for the island's future.

Beyond strengthening climate awareness and community engagement, these participatory activities also helped identify concrete transition priorities for Elba. Through **The Island I Would Like Lab** and the **CO2 PACMAN Tool**, citizens, students, experts, and local stakeholders progressively translated technical evidence and community perspectives into a shared set of transition directions and policy priorities that support the island's pathway toward climate neutrality.

Co-created Transition Priorities

On Elba, the identification of transition priorities emerged from a comparative, participatory simulation process involving students, institutional actors, and technical stakeholders. Rather than converging immediately toward a single shared scenario, the process enabled different groups to independently explore alternative decarbonization pathways and assess their implications for the island's environmental, territorial, and socio-economic context.

During **The Island I Would Like Lab**, participants interacted with the **CO2 PACMAN Tool** to evaluate a broad portfolio of policy options to reduce greenhouse gas emissions across sectors, including **energy, mobility, buildings, waste management, and land use**. By testing different combinations of measures, stakeholders were able to compare mitigation potential, territorial compatibility, and perceived feasibility of implementation under the island's specific conditions.

Unlike the approach adopted on other pilot islands, the participatory process on Elba was organized around relatively homogeneous stakeholder groups rather than mixed working tables. Six simulation sessions involved students participating in the **Youth Think Tank**, while two additional sessions involved **public administrations, local organisations, and technical stakeholders**. This structure enabled the emergence of differentiated perspectives reflecting different priorities, levels of technical awareness, and perceptions of feasibility within the transition process.

Among the student groups, three of six achieved climate neutrality using the scenarios developed with the Tool, while the remaining groups still achieved significant emission reductions through diversified combinations of measures (Figure 23). This reflects a generally proactive and exploratory approach, characterized by openness toward multiple intervention strategies and innovative solutions.

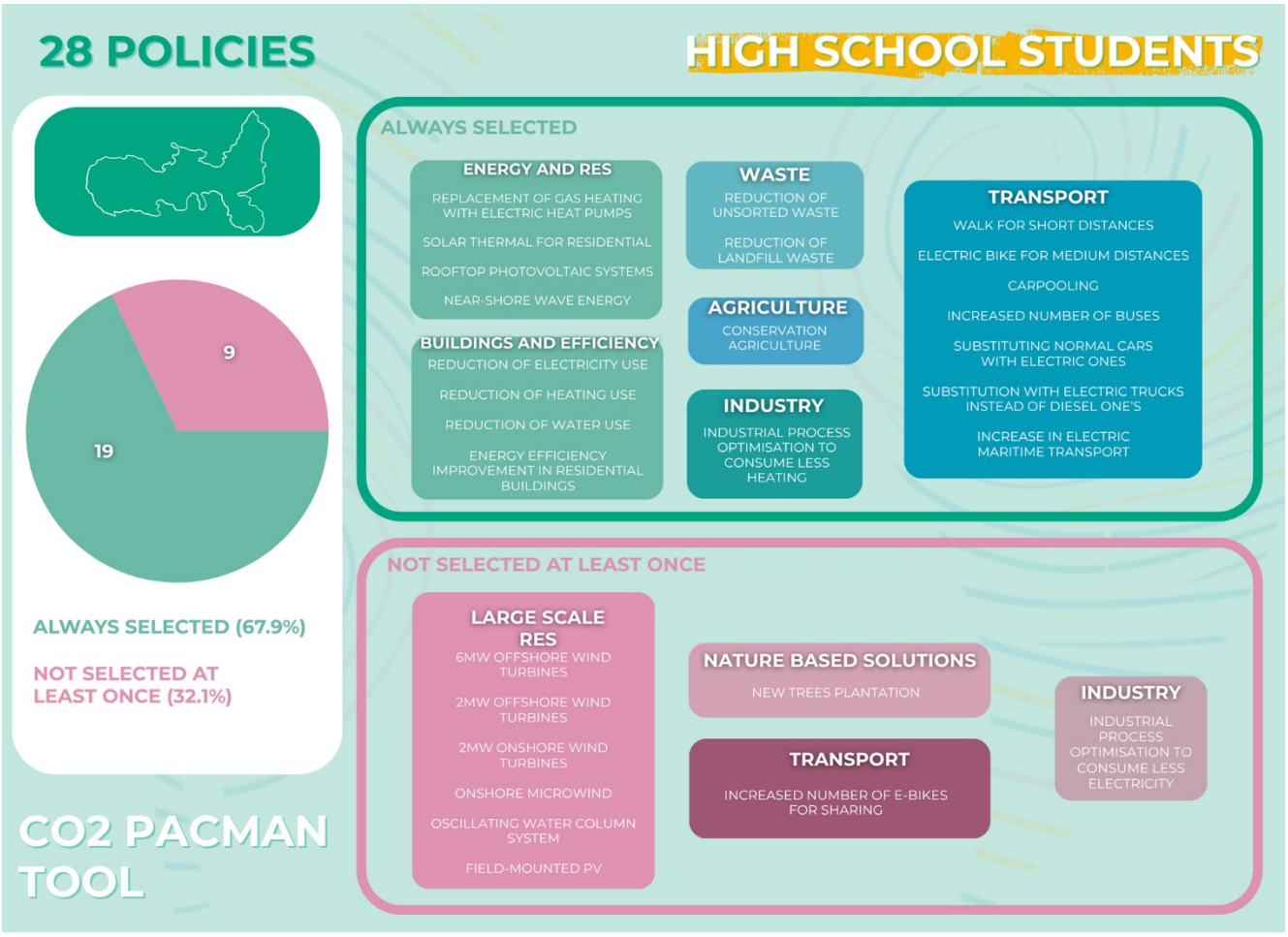

Figure 23: Policy prioritisation emerging from the Youth Think Tank simulation sessions, highlighting the measures most frequently selected and excluded by student groups during the co-creation process.

By contrast, institutional and technical stakeholders initially adopted a more cautious and selective approach. In the first simulation session involving public administrations and local actors, climate neutrality was not achieved, reflecting a stronger focus on implementation constraints, perceived feasibility barriers, and a systemic understanding of the transition process (Figure 24).

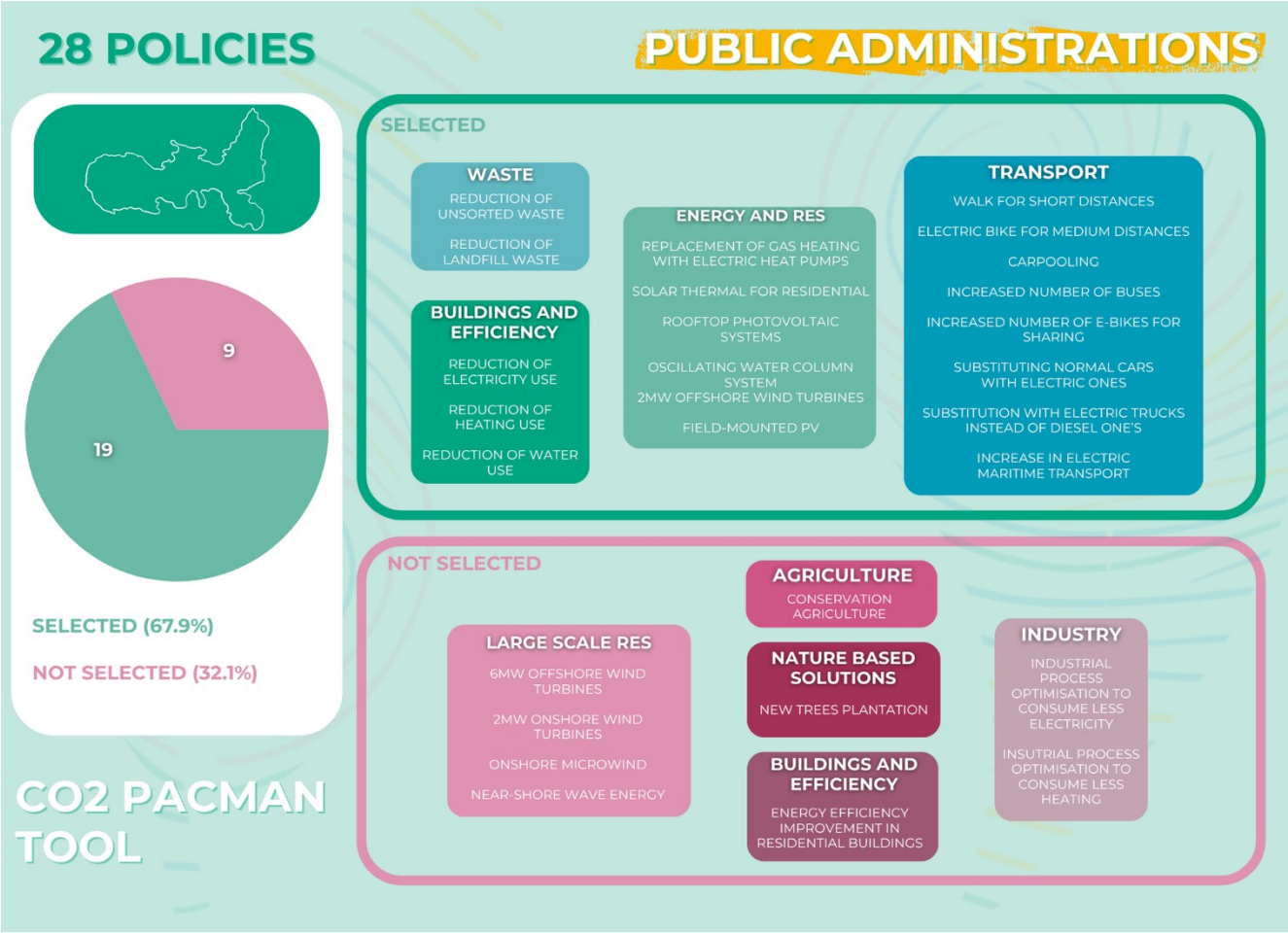

Figure 24: Policy prioritisation emerging from the first simulation session involving public administrations illustrates the selective policy mix and the measures excluded during the co-creation process.

A second session, conducted several months later and involving a broader range of public and private administrators and technical experts, instead resulted in the achievement of climate neutrality through a more integrated and comprehensive policy mix (Figure 25).

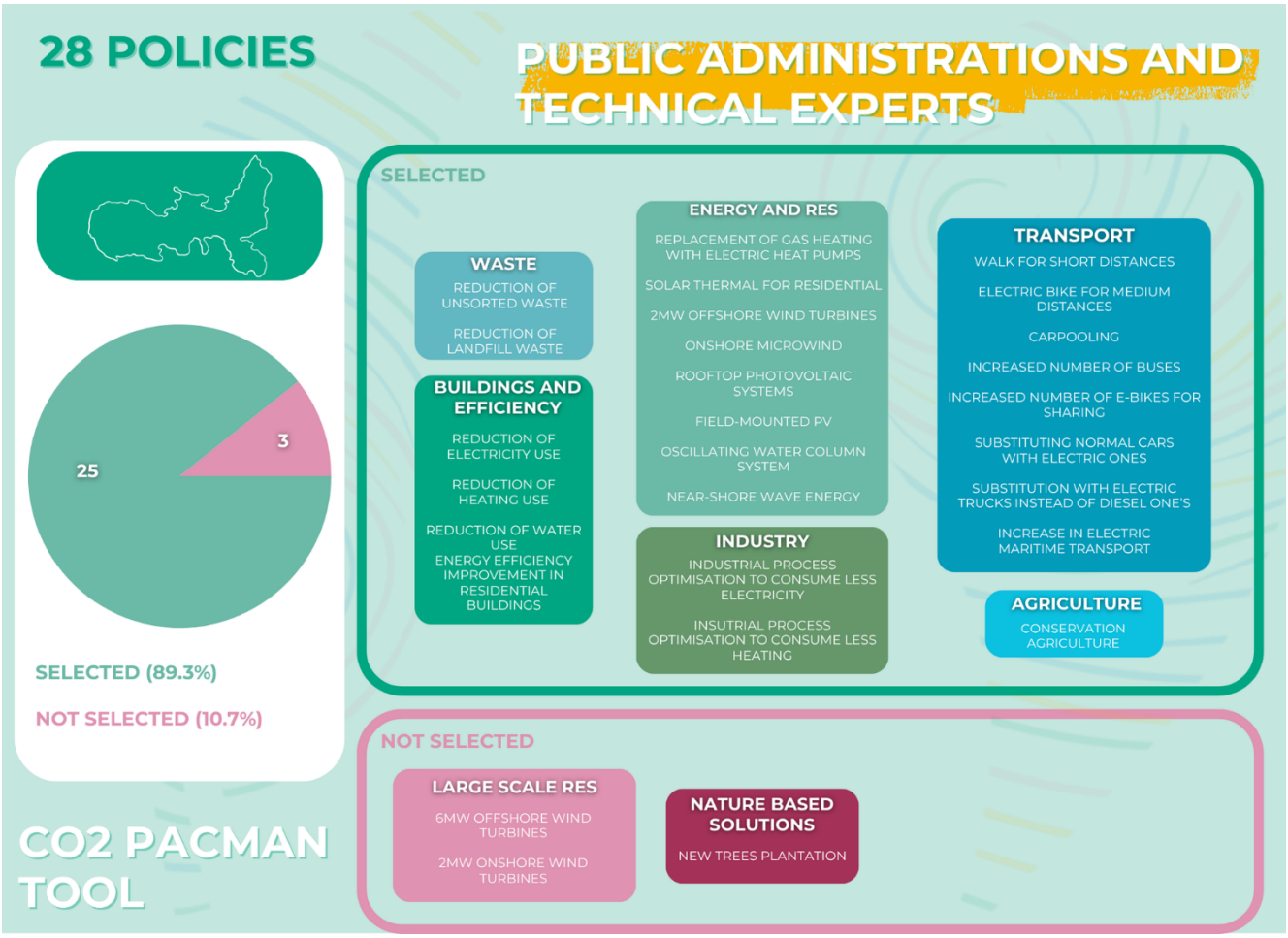

Figure 25: Policy prioritisation emerging from the second simulation session involving technical experts and institutional stakeholders, highlighting the more integrated policy mix contributing to the achievement of climate neutrality.

The analysis of policy selection highlights several recurring patterns across the different groups. Among students, the most frequently excluded policies included **large-scale wind energy systems**, particularly offshore and onshore installations, as well as certain field-mounted photovoltaic systems. This distribution suggests concerns related to territorial compatibility, landscape integration, and infrastructure intensity. At the same time, students consistently prioritized a diversified combination of interventions, including **renewable energy, conservation agriculture, waste management, energy efficiency, and nature-based solutions**, reflecting a broad and systemic understanding of the transition process.

A comparison between the most frequently selected policies and the measures generating the highest emissions reductions also revealed an important dynamic within the participatory process. While participants often prioritised diversified and locally acceptable interventions, the highest mitigation potential was associated with a more concentrated

set of measures, particularly **transport electrification, offshore wind energy, photovoltaic systems, and marine energy solutions**. This highlights a partial gap between perceived priorities and actual mitigation potential, underscoring the importance of participatory tools that support dialogue among community preferences, territorial constraints, and quantitative evidence.

The comparison between the two sessions involving institutional and technical stakeholders also highlights the importance of **process continuity and knowledge consolidation** in roadmap development. The second session demonstrated a more open and comprehensive approach to policy selection, suggesting that the progressive accumulation of local knowledge, stakeholder dialogue, and familiarity with the Tool helped strengthen confidence in more integrated transition pathways.

Overall, the participatory simulations conducted on Elba demonstrate the value of integrating **diverse stakeholder perspectives within a shared decision-support environment**. While students tended to adopt a broader and more exploratory approach, institutional and technical actors focused more selectively on measures perceived as feasible and implementable within existing constraints. The **interaction between these perspectives helps balance ambition with realism and identify transition priorities that are both innovative and territorially grounded**.

Together, these **co-created priorities** illustrate how the participatory process on Elba supported the progressive refinement of **climate-transition strategies** through comparison, discussion, and collective learning across different stakeholder groups. The simulations revealed not only shared priorities but also differing perceptions of **feasibility, territorial compatibility, and mitigation ambition**, helping to frame the island's transition pathway as a dynamic balance between **environmental objectives, local constraints, and socially acceptable solutions**.

One of the most significant outcomes of the simulation process was the observable shift in stakeholder attitudes. Participants who initially expressed strong opposition to certain technologies became more open to their partial deployment once they were able to assess the full range of decarbonisation options, their combined impacts, and the trade-offs associated with alternative pathways. This demonstrates the value of participatory decision-support tools in fostering informed, evidence-based discussions about climate transition choices.

While these **co-created priorities** helped identify locally supported transition directions for Elba, their implementation ultimately depends on adequate **financial resources, governance capacity, and long-term institutional support.** For this reason, the roadmap for Elba also considers the **financial and operational conditions** needed to translate strategic priorities into concrete, implementable transition actions.

Financing Pathways and Implementation Capacity

Implementing the transition priorities identified for Elba requires the capacity to connect climate objectives with realistic financial and institutional conditions. For this reason, the roadmap also considers how different funding opportunities and governance instruments may support the gradual implementation of the island's transition pathway.

In the case of Elba, climate neutrality is closely linked to the transformation of sectors that are central to the island's territorial identity and economy, including **tourism, mobility, agriculture, and environmental management**. Supporting this transition, therefore, requires financial instruments that can combine infrastructure investments, environmental protection, innovation, and local economic development.

Several European and national programmes may contribute to this process. European funding instruments such as **Horizon Europe**, the **LIFE Programme**, and the **Innovation Fund** can support pilot experimentation, environmental restoration, renewable-energy solutions, and sustainable mobility initiatives. These instruments may be particularly relevant for supporting the renewable energy scenarios explored on Elba, including photovoltaic deployment in former mining areas, agrivoltaic systems, ecosystem restoration initiatives, and sustainable mobility solutions.

At the national level, current instruments linked to the Italian energy-transition and island-transition policies, including initiatives such as **Transition 5.0** and **MIMIT - Piano nazionale Transizione 4.0**, may support renewable-energy deployment and infrastructure modernisation in the short and medium term.

Regional and territorial programmes may also play an important role within Elba's transition process. In particular, regional development instruments, rural-development programmes, and local territorial initiatives can support SMEs, sustainable tourism activities, conservation agriculture, and community-based transition projects, helping to adapt climate strategies to the island's environmental and socio-economic conditions.

From this perspective, the transition pathway for Elba depends not only on the availability of financial resources but also on the capacity to coordinate actors, combine funding instruments, and progressively transform local priorities into operational projects. The roadmap, therefore, highlights the importance of integrating climate-transition objectives with territorial development strategies, reinforcing the connection between **environmental sustainability, economic resilience, and long-term implementation capacity.**

The roadmap developed for Elba integrates **renewable energy strategies, participatory governance, innovation-oriented solutions, community engagement, and implementation-oriented financing within a flexible, territorially grounded climate neutrality framework**. By connecting these dimensions, the Roadmap supports the

island's long-term transition while balancing environmental sustainability, local development, and landscape compatibility. In the short term, implementation efforts may focus on sustainable mobility, energy efficiency, and community-based initiatives. Larger infrastructure investments, including offshore renewable energy systems and broader energy-transition measures, will require longer planning horizons and more substantial financial support (Figure 26).

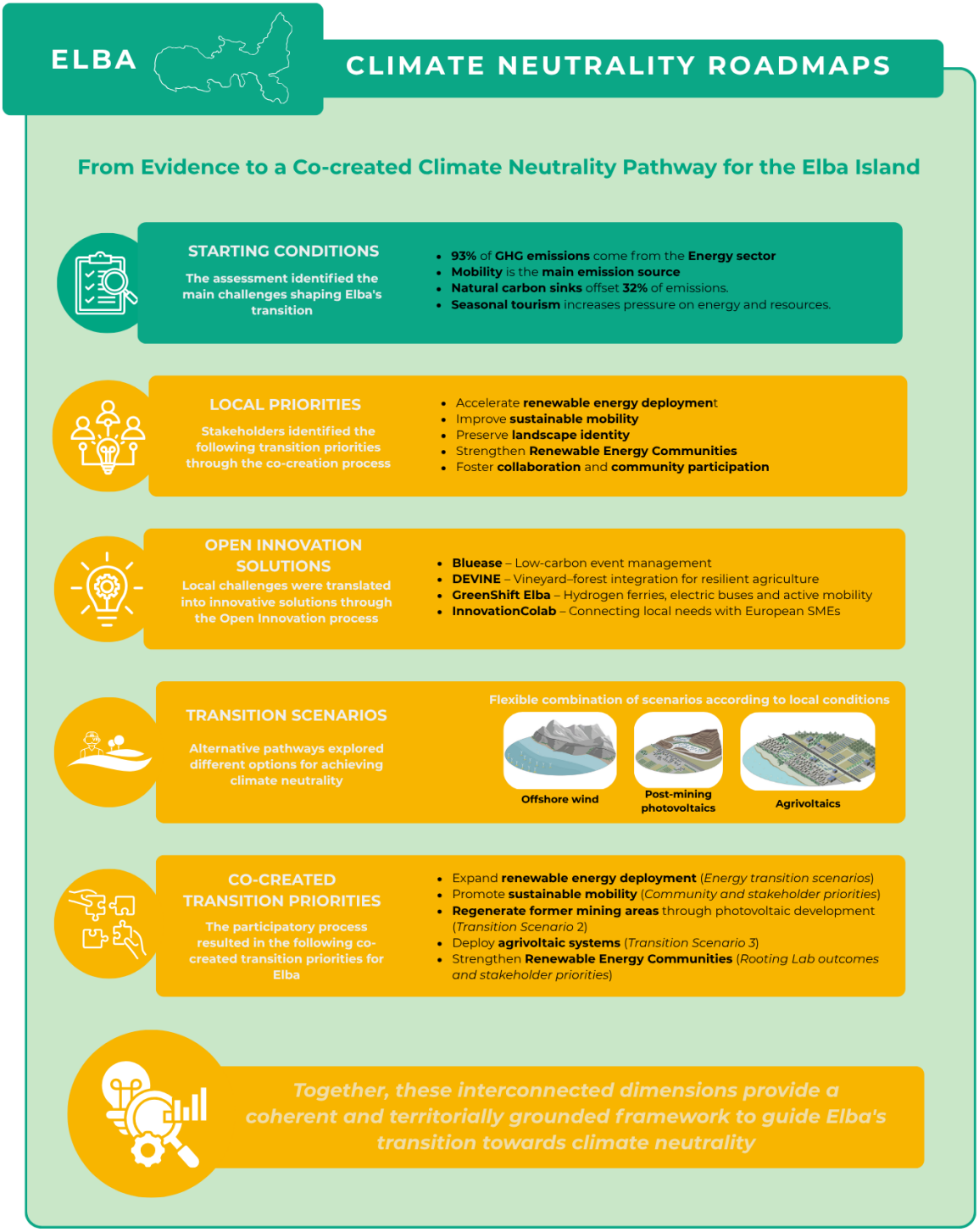

Figure 26: Climate Neutrality Roadmap at a Glance for Elba.
Summary of the co-created transition pathway, illustrating how technical evidence, stakeholder engagement, open innovation and scenario development contributed to the definition of shared transition priorities.

Crete – Climate Neutrality Transition Roadmap

The Climate Neutrality Transition Roadmap for Crete consolidates the results of the co-creation process conducted during the project, translating analytical findings and stakeholder interactions into a structured pathway towards climate neutrality for the island. Developed through an integrated, participatory, and evidence-based process, the Roadmap combines technical analysis, stakeholder engagement, and co-creation activities to support a climate-neutral and climate-resilient future for Crete.

Following the assessment phase, which provided a comprehensive understanding of the island's emission profile and structural characteristics, the focus shifted from understanding "where Crete stands" to outlining its pathway towards climate neutrality. Building on this shared understanding, the transition was shaped through an iterative approach combining quantitative assessment, stakeholder engagement, spatial analysis, and policy dialogue.

Rather than outlining a predefined set of sectoral measures, the Roadmap integrates technical knowledge, territorial insights, and stakeholder contributions to identify realistic and context-sensitive transition directions. Through scenario exploration and participatory processes, supported by spatial visualisation tools, stakeholders examined how different technological and policy options could be aligned with the island's environmental and socio-economic context.

In this perspective, the Roadmap goes beyond a simple listing of mitigation measures. It brings together analytical evidence, local priorities, and spatial considerations into a coherent transition pathway, outlining a shared trajectory towards a climate-neutral future for Crete, as shaped through the participatory process (Figure 27).

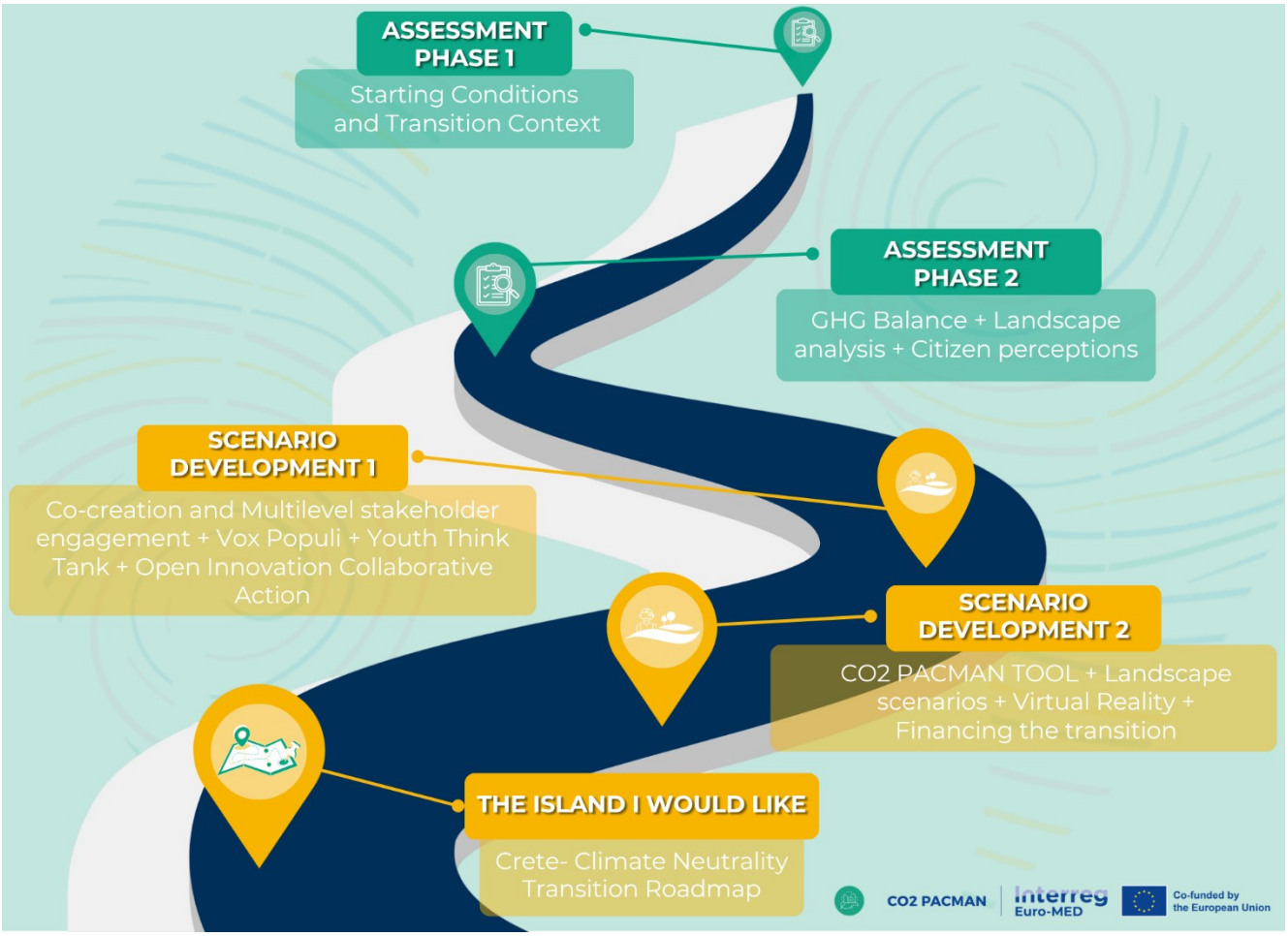

Figure 27: Conceptual pathway guiding the development of the Climate Neutrality Transition Roadmap for Crete

Starting Conditions and Transition Context

The Climate Neutrality Transition Roadmap for Crete builds on a comprehensive understanding of the island's **greenhouse gas profile**, its **territorial characteristics**, **its evolving climate-action and green-transition strategies** and its **stakeholder dynamics**.

The assessment phase highlights the predominance of the **Energy sector**, accounting for 64% of total gross emissions (1,877.67 kt CO_2eq). This reflects the central role of energy consumption in the island's emissions profile. The **AFOLU sector** accounts for 23% (684.84 kt CO_2eq), while the **Waste sector** contributes 13% (395.17 kt CO_2eq). The **Industrial Processes sector** accounts for 0 kt CO_2eq in the CO2 PACMAN assessment framework, because the IPCC methodology includes only process emissions from mineral, chemical, and metal production activities, which are absent in Crete. Emissions associated with the island's agri-food and building-material sectors are accounted for within the Energy sector

(energy consumption) and the AFOLU sector (agricultural activities), respectively.

Overall, total gross emissions amount to 2,958 kt CO_2eq. Carbon sinks compensate for approximately 41% of these emissions (1,221 kt CO_2eq), resulting in net emissions of 1,737 kt CO_2eq.

Beyond the quantitative profile, the territorial and stakeholder context further shapes the transition pathway. The process was activated through the **Rooting Lab**, which engaged local and regional authorities, SMEs, infrastructure and service providers, academic institutions, NGOs, and citizens. Through participatory workshops, co-design activities, and public events, stakeholders contributed to discussions on climate neutrality and to the interpretation of the island's baseline conditions.

Through a structured SWOT analysis, stakeholders identified key strengths, weaknesses, opportunities, and threats shaping Crete's transition context. The analysis highlights elements related to renewable energy potential, environmental awareness, and emerging circular-economy opportunities, as well as constraints related to energy use, mobility, water scarcity, and seasonal pressures linked to tourism activities. Reported challenges include climate change impacts, delays in policy implementation, barriers to change, and the social acceptance of certain renewable-energy interventions. At the same time, identified opportunities relate to renewable energy development, improvements in transport systems, and actions discussed during the participatory process.

In parallel, the AskyourcitizenonCaN survey indicates a high level of environmental awareness among residents, with 89% of respondents reporting awareness of climate change and 63% recognising the need to adopt mitigation measures. A large majority (83%) support the objective of achieving climate neutrality, while only 37% of respondents are optimistic that the island will meet this target by 2040.

Citizens identified waste management (69%), renewable energy (65%), transportation (60%), energy efficiency in buildings (53%), and sustainable agriculture and forestry (42%) as priority areas for reducing environmental impacts. Survey results show that **most respondents (61%) support landscape changes under specific conditions**, while 36% prefer to maintain current landscape conditions and 3% remain indifferent. This highlights the importance of landscape considerations in shaping the island's transition process, particularly regarding the acceptance of landscape transformations and the role of participatory and visualisation tools in supporting informed decision-making.

Early stakeholder exchanges and participatory activities contributed to discussions on energy use, mobility, waste management, and climate neutrality.

Taken together, Crete's starting conditions highlight a context characterised by a strong predominance of energy-related emissions, contributions from AFOLU and waste sectors, and a high level of stakeholder engagement and public awareness. These conditions provide the starting point for defining the island's transition pathway (Figure 28).

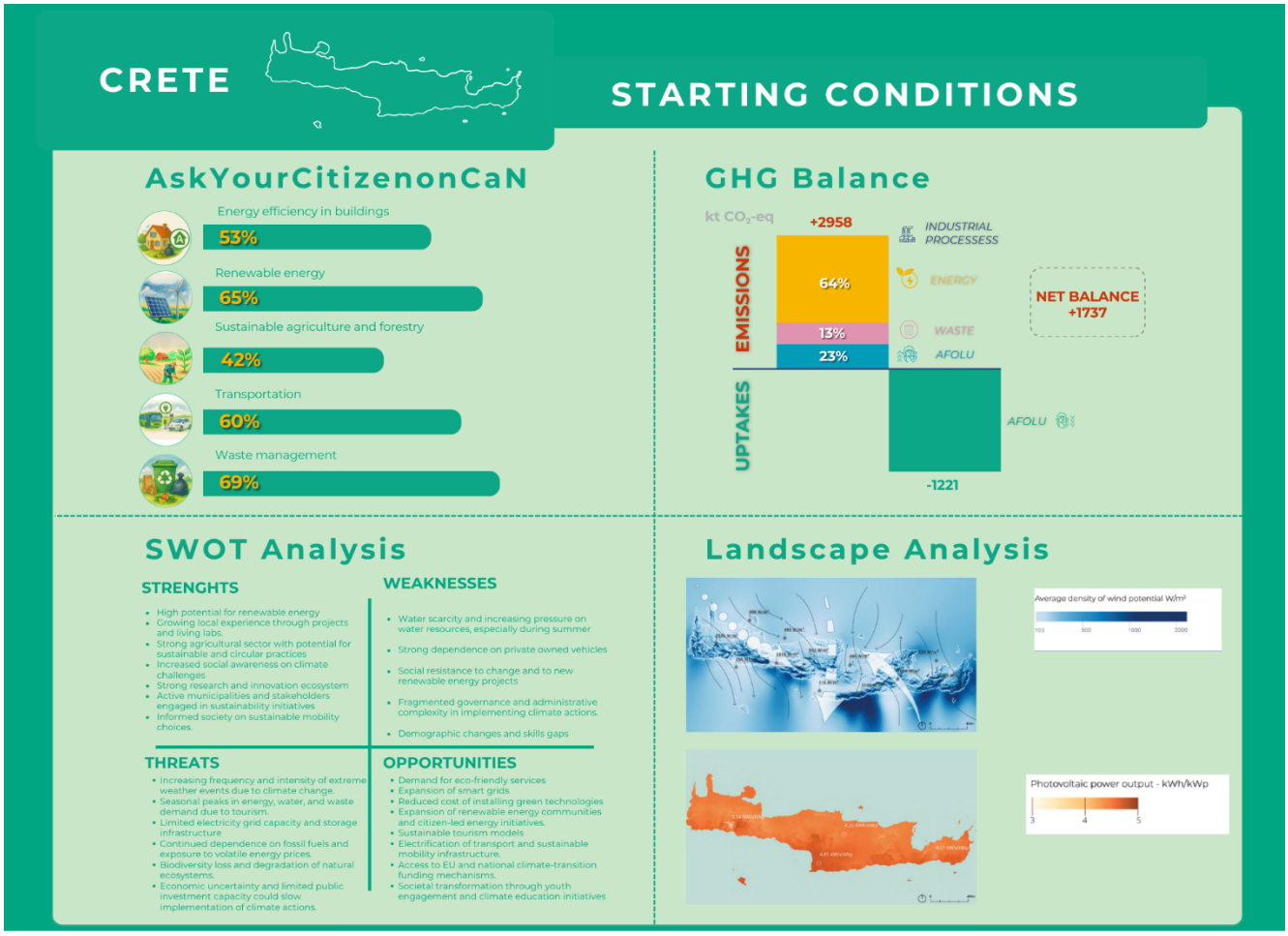

Figure 28: Overview of Crete's starting conditions: presenting greenhouse gas balance assessment, territorial SWOT analysis, and citizen perception insights collected during the Rooting Lab.

The Climate Neutrality Transition Roadmap, therefore, translates these insights into a **structured territorial transition process** for Crete, aligning **technical analysis**, **territorial conditions**, and **community priorities** to guide the island's long-term climate transition.

Crete Integrated Pathway to Climate Neutrality

The transition pathway for Crete is structured around five interconnected dimensions, combining **technical assessment, spatial planning, stakeholder engagement,**

innovation-oriented solutions, and implementation feasibility.

Building on the analyses and participatory activities developed through the **CO2 PACMAN project,** while taking into account the existing energy-transition and climate-policy frameworks already in place on the island, the roadmap translates **scientific evidence and local perspectives** into a coherent transition framework for the island.

Rather than defining a fixed trajectory, the roadmap supports a **flexible, place-based pathway toward climate neutrality,** adapted to Crete's territorial, environmental, and socio-economic characteristics.

Energy & Landscape Transformation

In Crete, the transition toward climate neutrality was explored through a series of **integrated landscape scenarios** that investigated how renewable energy systems could interact with urban areas, agricultural systems, inland water bodies, coastal environments, and ecological networks across the island. The scenarios emerged through a collaborative process involving researchers, planners, stakeholders, and decision-makers, ensuring that landscape and energy considerations were explored within a shared territorial perspective.

The process combined **spatial analysis, scenario development, and immersive visualisation tools** to support discussion on the territorial implications of different decarbonisation strategies. Rather than focusing exclusively on energy-production targets, the project's activities examined how renewable-energy infrastructure may coexist with environmental systems, productive landscapes, tourism activities, and public spaces.

To support stakeholder engagement and facilitate public understanding, immersive **Virtual Reality (VR) simulations** were developed as part of the **CO2 PACMAN Toolkit**. The VR environments allowed participants to directly explore proposed renewable-energy interventions from multiple viewpoints and spatial perspectives, helping them better understand visual impacts and interactions among energy infrastructure, ecological systems, and public space. By making future scenarios easier to visualise and discuss, the simulations supported more informed reflections on **landscape integration, territorial compatibility, and alternative transition pathways** (Figure 29).

Figure 29: Immersive visualisation of renewable-energy and climate-adaptation scenarios in Crete. (a) Floating photovoltaic systems integrated within the Potamon Dam landscape; (b) photovoltaic pergolas and microclimate interventions at the Port of Rethymno.

Building on this process, **three integrated and interchangeable landscape perspectives** were developed to reflect different ways of integrating renewable energy production into the island's territorial structure.

Scenario 01 – Urban and Coastal Energy Integration

The first scenario explored the transformation of urban and coastal areas through the integration of **photovoltaic pergolas, building-integrated photovoltaics, geothermal systems, and agrivoltaic greenhouses** (Figure 30). In this scenario, renewable-energy production is combined with urban cooling, biodiversity enhancement, shaded public spaces, and climate-adaptation measures, linking decarbonisation objectives with improvements in environmental quality and public-space usability.

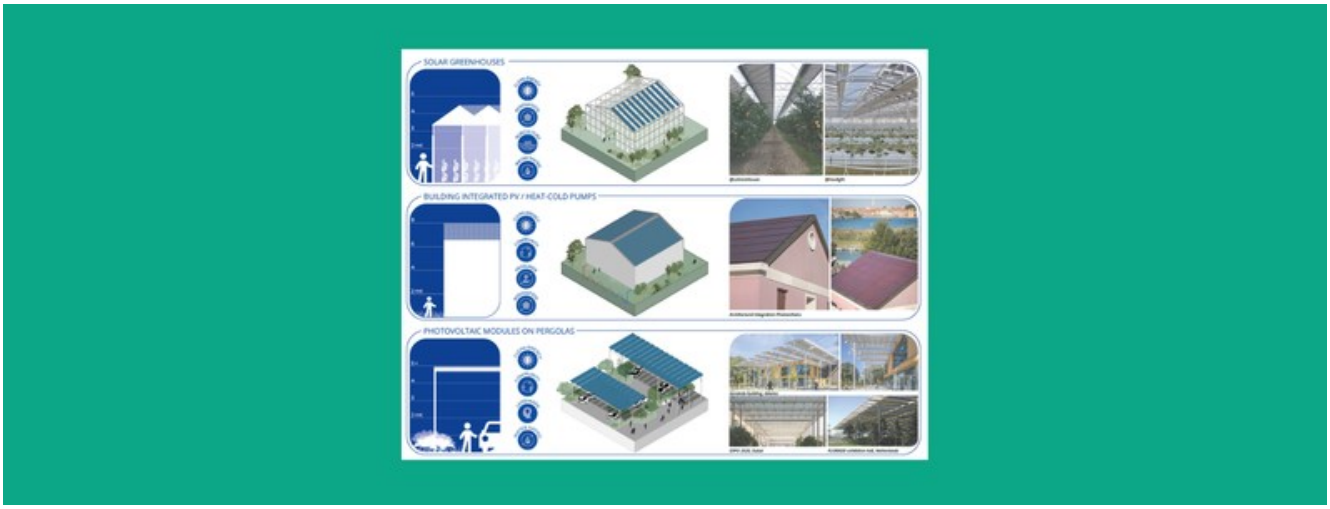

Figure 30: Urban and coastal energy-integration scenario for Crete, illustrating the combination of renewable-energy systems, climate-adaptation measures, and public-space enhancement strategies.

Scenario 02 – Renewable Energy and Ecological Coexistence

The second scenario focused on the coexistence of **renewable energy infrastructure and ecological systems** (Figure 31). The scenario combines floating photovoltaic systems integrated with floating vegetated islands in inland reservoirs, together with offshore floating wind farms associated with marine habitat enhancement and artificial reef systems. This approach explores how renewable-energy generation can potentially contribute not only to decarbonisation but also to **biodiversity support and ecological regeneration**.

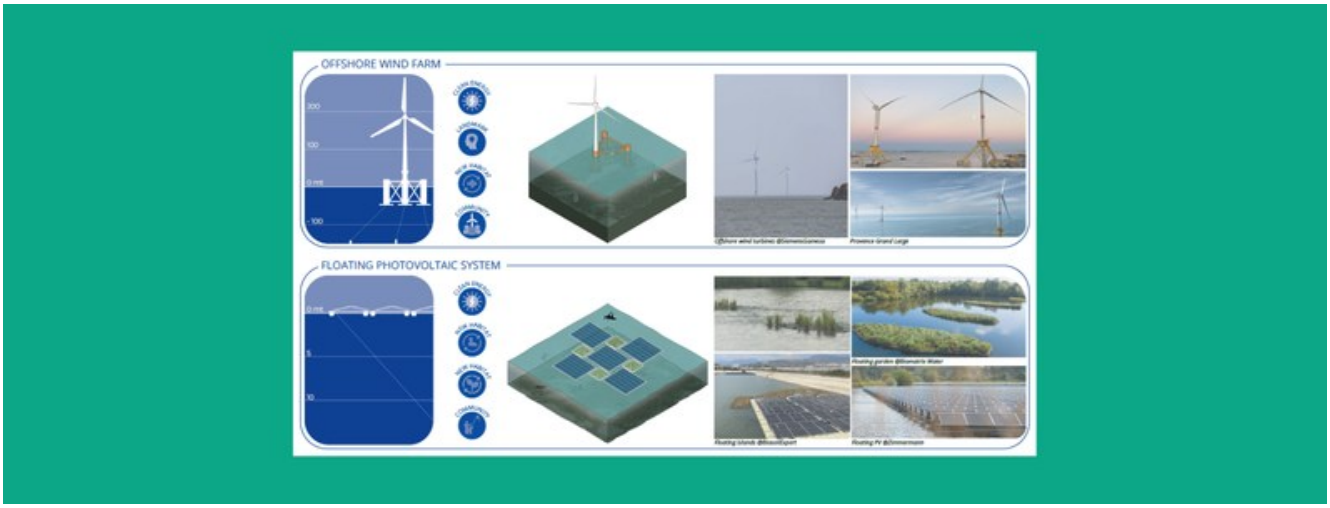

Figure 31: Renewable-energy and ecological-coexistence scenario for Crete, illustrating floating photovoltaic systems, offshore wind infrastructures, and ecosystem-enhancement strategies.

Scenario 03 – Agrivoltaics and Rural Resilience

The third scenario explored the integration of **agrivoltaic systems within inland agricultural areas** (Figure 32). The scenario focuses on strengthening local production systems, supporting water-saving practices, improving rural energy autonomy, and enhancing the resilience of agricultural landscapes. In this model, renewable-energy generation becomes integrated with productive and socio-economic functions, contributing to the revitalisation of inland rural areas.

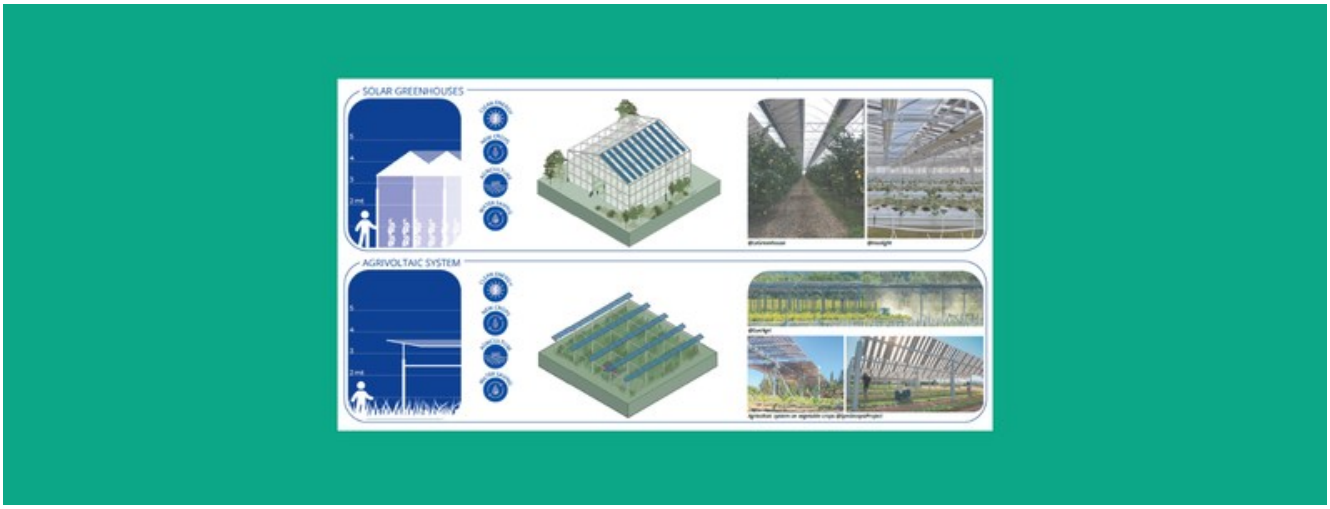

Figure 32: Agrivoltaic and rural-resilience scenario for Crete, illustrating the integration of photovoltaic systems within agricultural landscapes and local production systems.

Together, the three scenarios illustrate complementary pathways for integrating renewable energy within Crete's diverse territorial contexts, ranging from urban and coastal environments to ecological systems and rural production landscapes.

In Crete, the transition toward renewable energy is therefore part of a broader **territorial transformation process** in which decarbonisation, ecological adaptation, public-space quality, and productive landscapes are closely interconnected. Rather than converging on a single energy model, the process highlights the importance of maintaining flexibility and adapting transition strategies to the island's diverse environmental and territorial conditions.

Alongside the exploration of **renewable energy scenarios and landscape**

transformations, the transition pathway for Crete also considers how innovation processes can help address specific territorial and operational challenges. For this reason, the Roadmap further examines a set of **innovation-oriented solutions** supporting environmental resilience, sustainable resource management, and low-carbon transition strategies.

Innovative Solutions for the Island Transition

The Open Innovation Cooperative Action created a structured process connecting challenges identified by local actors in Crete with innovation solutions proposed by European SMEs, startups, and research institutions.

The process followed a **bottom-up approach**. Through local Labs and stakeholder discussions, public authorities, tourism actors, research institutions, and territorial organisations identified a set of operational challenges linked to climate neutrality and sustainable territorial development. These challenges focused particularly on **circular-economy practices, sustainable tourism systems, and low-carbon mobility solutions**.

The process for selecting the solutions best suited to the challengers' needs was the same as on the two islands already explained: they were published on the website https://www.innovationcolab.eu , proposals were received, the most promising ones were selected, they were seen at the Valencia Business Forum.

The selected proposals were subsequently presented and discussed during **The Crete I'd Like Lab**, where the Open Innovation activities were integrated within a broader participatory framework dedicated to the island's transition toward climate neutrality. Despite more limited participation conditions than on the other pilot islands, the process maintained visibility of the selected solutions and reinforced dialogue between local stakeholders and external innovation actors.

Three priority challenges were ultimately addressed for the **island of Crete**.

Circular Alternatives to Peat-Based Materials

The Intermunicipal Solid Waste Management Company (**DEDISA**) identified the need to reduce the use of peat-based materials by exploring circular alternatives derived from organic waste streams (Figure 33). In response, SilviBio proposed innovative peat alternatives based on organic waste valorisation, while additional proposals explored the use of biochar and circular low-emission materials derived from agricultural residues.

The proposed solutions support the transition toward more circular waste management systems by transforming organic residues into reusable materials with potential applications in agriculture and environmental management. From this perspective, the interventions help reduce dependence on non-renewable materials while strengthening

local circular-economy practices. By valorising organic waste streams and reducing reliance on peat-based products, the proposed solutions contribute to circular-economy objectives while supporting lower-emission material cycles.

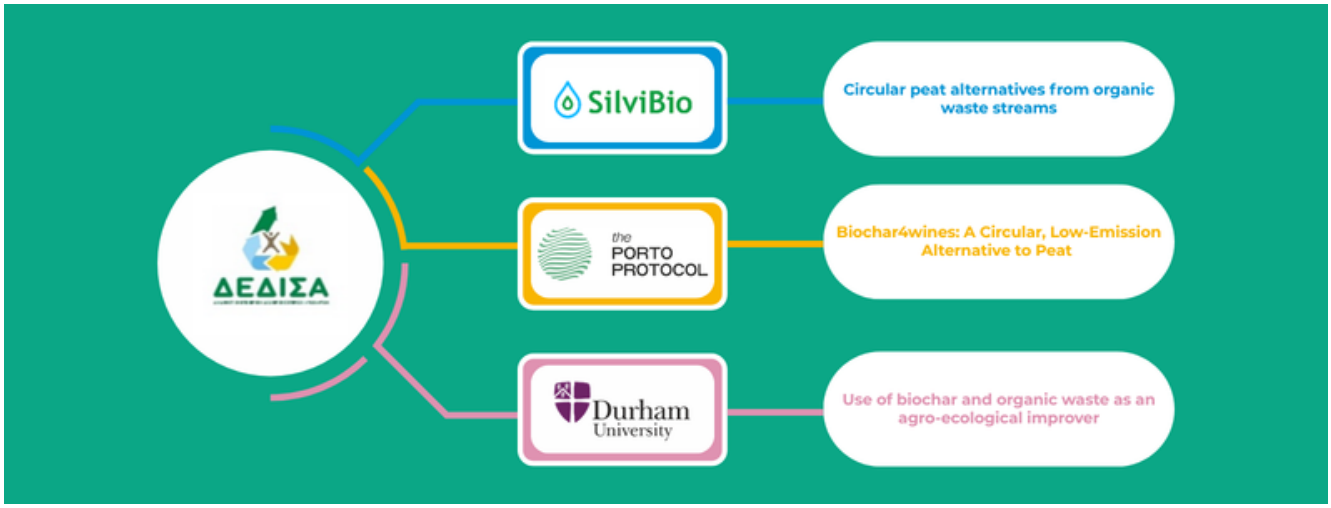

Figure 33: Innovation proposals developed in response to the circular peat-substitution challenge identified by DEDISA during the Open Innovation Cooperative Action.

Smart Mobility and Modal-Shift Monitoring

The Municipality of Rethymno, together with the Renewable and Sustainable Energy Systems Laboratory of the Technical University of Crete, identified the need to improve sustainable mobility planning through more advanced systems for monitoring pedestrian and cyclist flows (Figure 34). In response, LIS Data Solutions proposed an AI-driven urban mobility platform combining smart data collection, IoT technologies, and modal-split analysis tools.

The proposed interventions aim to support data-driven mobility planning that improves bicycle and pedestrian accessibility while strengthening the analytical basis for low-carbon urban mobility strategies. By integrating digital technologies with mobility planning, the solutions contribute to more efficient and adaptive approaches to sustainable transport management. Improved monitoring of mobility patterns can also support more targeted decarbonisation measures in one of the sectors most closely linked to Crete's emissions profile.

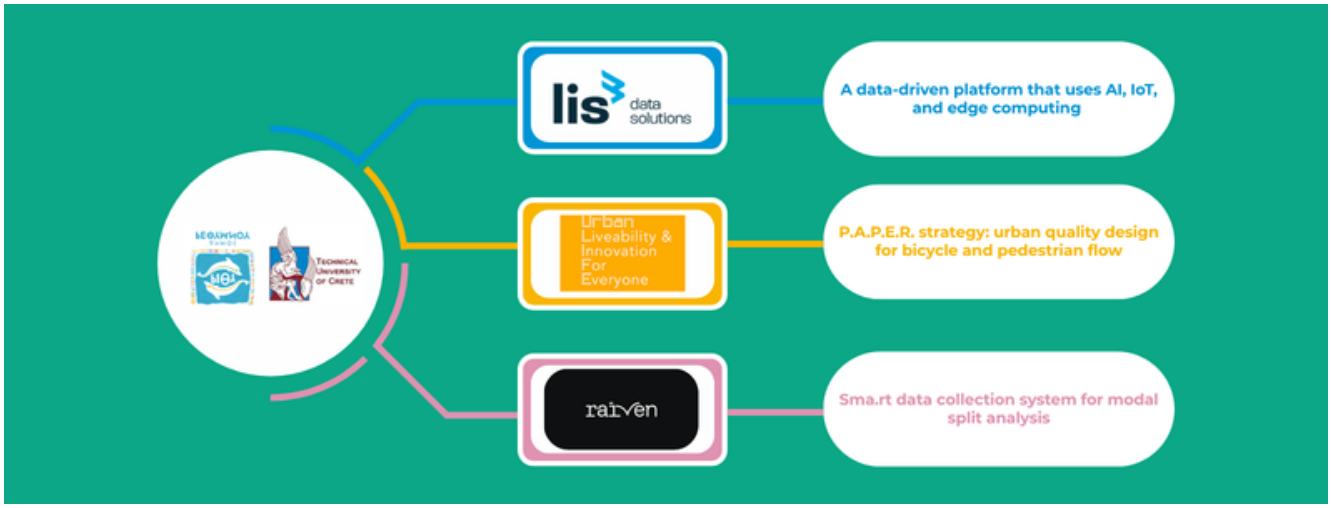

Figure 34: Innovation proposals developed in response to the sustainable mobility and modal-split analysis challenge identified by the Municipality of Rethymno and the Technical University of Crete during the Open Innovation Cooperative Action.

Organic Waste Management in the Tourism Sector

The Rethymno Hoteliers Association, in consultation with the Renewable and Sustainable Energy Systems Laboratory of the Technical University of Crete, highlighted the need to improve the on-site management and utilization of organic waste generated by medium- and large-sized hotels (Figure 35). In response, EFFIWASTE proposed a smart, small-scale organic waste treatment system designed to support zero-waste practices in hospitality facilities, while complementary solutions were explored for on-site organic waste management and waste-digestion systems.

The proposed interventions support the reduction and valorisation of organic waste within the tourism sector, contributing to circular-economy practices and more sustainable hospitality systems. In contexts where tourism activities place strong seasonal pressures on local waste management infrastructure, these solutions help connect climate-transition objectives with operational sustainability in the hospitality sector.

Figure 35: Innovation proposals developed in response to the organic waste management challenge identified by the Rethymno Hoteliers Association during the Open Innovation Cooperative Action.

Together, these interventions demonstrate that the transition pathway for Crete extends beyond renewable-energy deployment alone. The Open Innovation process also explored how **circular-economy practices, sustainable mobility systems, and tourism-related waste management** contributes to broader climate neutrality objectives while addressing locally identified operational challenges.

By connecting **local stakeholders, public authorities, SMEs, startups, research actors** and **representatives of the tourism sector** within a structured cooperation framework, the Open Innovation activities strengthened dialogue between territorial needs and external innovation capacities, reinforcing the role of collaboration and knowledge exchange within the island's transition process.

The Crete experience also demonstrated the importance of maintaining continuity and adaptability within innovation processes. Even under more constrained participation conditions, the selected solutions remained integrated within the territorial debate through presentations, discussions, exhibition spaces, and digital contributions. In this sense, **the Open Innovation process served not only as a mechanism for identifying technical responses but also as a platform that facilitated visibility, cooperation, and the long-term connection between island challenges and external innovation ecosystems**.

Beyond the operational challenges addressed through the Open Innovation activities, the roadmap process in Crete also **opened a broader reflection on how climate neutrality could reshape the island's future landscapes, mobility systems, environmental identity, and everyday life.** For this reason, the participatory activities developed within the project

focused on linking technical transition scenarios to local perceptions, territorial values, and collective visions for the island's future.

Community Perspectives and Youth Engagement

In Crete, the roadmap development process integrated technical analyses with participatory activities to examine how climate neutrality objectives might interact with the island's environmental identity, territorial characteristics, and daily life. In addition to the technical and spatial analyses conducted within the roadmap framework, **citizens, students, researchers, public authorities, entrepreneurs, and local stakeholders participated** in a range of dialogue activities to explore the island's future transition pathways.

Citizen perceptions, gathered through the AskyourcitizenonCaN survey, demonstrated **widespread recognition of climate change and general support for climate neutrality objectives**, particularly concerning waste management, renewable energy, and sustainable mobility. Simultaneously, responses underscored the importance of landscape quality, environmental preservation, and the maintenance of the island's natural character, indicating that **future transition measures are expected to remain compatible with Crete's ecological and territorial identity**.

These reflections were further enriched through **Vox Populi** interviews conducted during The Crete I'd Like Lab activities. Many participants described an ideal future island characterized by cleaner environments, reduced emissions, reduced dependence on automobiles, and greater harmony between human activities and natural systems. Several interviewees emphasized the importance of conserving forests, green spaces, beaches, and Crete's broader environmental identity, while others highlighted the need for greater environmental awareness and more active participation by local communities.

The interviews also revealed more **nuanced perspectives regarding the development of renewable energy**. While many participants acknowledged renewable energy as an essential component of the transition, some expressed concerns about potential visual and environmental impacts of future installations. These reflections illustrate that perceptions of climate neutrality in Crete encompass not only technological transition but also a process intrinsically linked to landscape quality, territorial identity, and quality of life.

These perspectives were further incorporated into **The Crete I Would Like Lab, which fostered dialogue among citizens, researchers, institutional actors, and local stakeholders on possible visions for the island's transition.** The Crete I Would Like Lab further expanded this dialogue by bringing together citizens, students, researchers, public authorities, entrepreneurs, and civil-society representatives to collectively reflect on possible transition pathways for Crete. Through workshops, stakeholder discussions, immersive visualisation experiences, exhibitions, participants explored alternative climate-

neutrality scenarios and discussed their implications for energy systems, mobility, landscapes, and quality of life. **By combining scientific evidence with local knowledge and community perspectives, the Lab strengthened collective reflection on the opportunities and challenges associated with the island's transition**.

Special attention was also given to engaging **younger generations** through Youth Think Tank activities, which aimed to enhance climate awareness and motivate students to reflect on the island's future. The initiative involved **secondary-school and university students** in workshops, awareness-raising activities, visioning exercises, and simulations using the **CO2 PACMAN Tool**. Through a progressive learning and participation process, students explored alternative decarbonisation pathways and reflected on the future of key sectors such as energy, mobility, tourism, waste, and water management.

The activities combined **climate-neutrality awareness**, collaborative discussions, and scenario exploration, encouraging participants to critically assess the challenges and opportunities associated with the island's transition. Students were invited to develop and discuss their own ideas for a climate-neutral Crete, connecting environmental objectives with everyday behaviours, community engagement, and long-term territorial development.

The involvement of **university students** further helped link technical knowledge with local perspectives, allowing participants to explore how planning tools and climate-transition strategies can be applied in real territorial contexts.

The participatory activities undertaken in Crete demonstrate that the transition toward climate neutrality transcends mere technical planning. The roadmap process fostered **multi-stakeholder dialogue, collective reflection, and a stronger sense of trust and ownership**, providing a platform for genuine collaboration on environmental challenges, territorial values, and community expectations within a shared vision for the island's future.

Beyond strengthening climate awareness and territorial dialogue, the participatory activities in Crete also helped identify concrete transition priorities for the island. Through simulation exercises and co-creation activities developed within the CO2 PACMAN Youth Think Tank, participants evaluated alternative policy combinations and explored pathways toward climate neutrality for Crete.

Co-created Transition Priorities

In Crete, transition priorities were explored through a series of **participatory and co-creation activities** developed within the framework of the **CO2 PACMAN Youth Think Tank**. Using the **CO2 PACMAN Tool**, participants interacted with alternative decarbonisation pathways and tested different policy combinations capable of reducing

the island's greenhouse gas emissions.

The activities combined **capacity-building, educational, and participatory dimensions,** encouraging younger generations to reflect on the long-term implications of climate-transition choices and on possible future trajectories for the island.

Through the simulations, participants evaluated a broad range of mitigation measures related to **renewable energy, energy efficiency, sustainable mobility, circular economy practices, and responsible consumption and production**. The results revealed a remarkably **proactive and optimistic approach toward climate neutrality**. Of the seven student groups, six achieved carbon neutrality within the simulation framework, while the remaining group still achieved substantial emission reductions by implementing multiple mitigation measures (Figure 36).

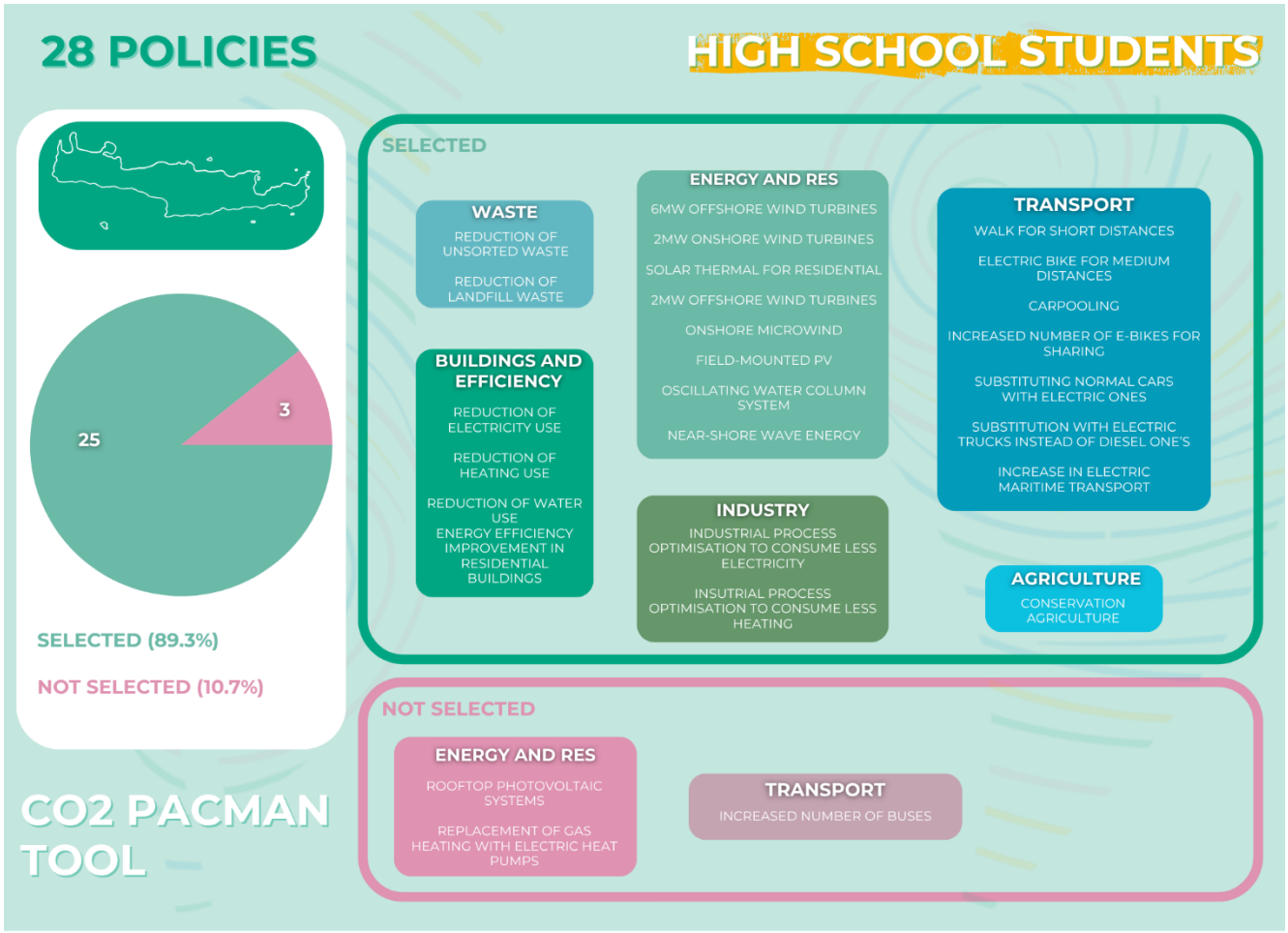

Figure 36: Policy prioritisation emerging from the Youth Think Tank simulation activities in Crete, illustrating the measures most frequently selected and excluded by student groups during the co-creation process.

The collective evaluation of policy options also revealed a very high level of acceptance of

the mitigation portfolio proposed within the simulation framework. Of the **28 policy measures** available in the tool, only a very limited number were excluded during the exercises. This broad openness toward decarbonisation measures suggests a generally positive perception of transition-related interventions among younger participants.

Particularly significant was the limited resistance shown toward **renewable energy deployment**. The student groups generally perceived renewable energy technologies as legitimate and necessary components of the transition process, approaching future energy infrastructure from a largely **solution-oriented perspective**.

The simulations also revealed strong convergence regarding the measures perceived as most impactful for reducing emissions. **Transport electrification, renewable energy deployment, and nature-based solutions consistently emerged as** the priorities most strongly supported across the different groups. This alignment highlights a shared understanding among participants of the importance of combining **technological innovation, behavioural change, and environmental restoration** within future decarbonisation pathways.

Beyond the quantitative results from the simulations, the activities demonstrated the potential of **participatory and educational tools** to strengthen climate awareness and encourage younger generations to actively engage in territorial transition processes. By allowing participants to directly interact with emission scenarios and policy options, the simulations transformed climate neutrality from an abstract objective into a more tangible and discussable territorial challenge.

Overall, the co-creation activities developed in Crete highlight how **participatory simulation tools** can support not only technical reflection on mitigation pathways but also broader processes of **awareness-building, dialogue, and collective imagination** about the island's future.

While the participatory simulations helped identify shared transition priorities and strengthen climate awareness among younger generations**, the long-term implementation of these pathways also depends on the availability of adequate financial instruments, governance coordination, and institutional capacity**. For this reason, the roadmap further explores the financing conditions that support Crete's transition toward climate neutrality.

Financing Pathways and Implementation Capacity

The transition pathway developed for Crete highlights not only the environmental and technological dimensions of climate neutrality but also the need to identify financing conditions that can support long-term implementation. Given the scale and diversity of the

interventions explored for the island - ranging from renewable energy systems and climate-adaptive public spaces to circular-economy solutions, sustainable tourism initiatives, and low-carbon mobility measures - the transition process requires the mobilisation of multiple and complementary funding instruments.

In Crete, the financing landscape reflects the complexity of implementing climate-transition strategies in a large and geographically diverse island context. The coexistence of urban areas, tourism infrastructures, agricultural systems, coastal environments, and energy networks implies that different interventions operate at different spatial and financial scales. As a result, the transition cannot rely on a single funding mechanism but requires a combination of European, national, regional, and investment-based instruments to support both experimentation and large-scale deployment.

European programmes can support the early phases of innovation, pilot experimentation, and territorial cooperation. Instruments such as Horizon Europe, the LIFE Programme, and Interreg cooperation programmes provide opportunities to test innovative solutions, develop demonstration projects, and strengthen collaboration among public authorities, research institutions, private actors, and local communities working on climate-transition challenges.

At the same time, the implementation of larger-scale infrastructure - including renewable energy systems, energy storage solutions, climate-resilient infrastructure, smart urban interventions, and sustainable mobility systems - requires access to broader investment mechanisms and long-term financing instruments. In this perspective, instruments linked to the European Investment Bank (EIB), the InvestEU Fund, and the emerging **Greek Islands Decarbonisation Fund** may play a particularly important role in supporting capital-intensive transition projects and reducing investment risks.

National and regional instruments also represent a significant component of the transition framework for Crete. Greece's Partnership Agreement 2021–2027, the National Strategic Reference Framework (NSRF), the Regional Operational Programme (ROP) of Crete, and sectoral programmes linked to energy transition, sustainable transport, rural development, and green infrastructure may support interventions across multiple sectors. **Agricultural transition measures may also benefit from instruments associated with the Common Agricultural Policy (CAP), particularly for sustainable farming practices, water-efficiency measures, agri-environmental actions, and climate-resilient land management.**

Beyond public funding, **private investment** can also support renewable energy projects, building renovation, sustainable tourism initiatives, circular-economy solutions, and innovative business models. **Energy communities** and cooperative ownership schemes may further contribute to mobilising local resources and strengthening local participation in the transition process.

Successful implementation, however, depends not only on financial resources but also on

effective coordination among public authorities, research institutions, businesses, civil-society organisations, and local communities. From this perspective, financing becomes both a financial and a **governance challenge**, requiring the capacity to connect local priorities with appropriate funding opportunities.

The transition pathway for Crete therefore relies on a **multi-level financing ecosystem** capable of supporting innovation, investment, and implementation across different sectors and territorial contexts.

The roadmap co-created for Crete integrates renewable energy transformation, participatory governance, innovation-oriented solutions, educational engagement, and implementation-oriented financing within a flexible, territorially grounded climate neutrality framework. **Together, these dimensions provide a coherent pathway for supporting Crete's transition toward a climate-neutral future. The roadmap supports a transition that remains adaptable to the island's environmental, social, and territorial complexity.**

The **Climate Neutrality Transition Roadmaps** developed for the pilot islands are not only territorial planning tools but also contribute to broader European climate policy objectives. Understanding how these locally grounded transition pathways **relate to the European Union's climate and energy policy framework** helps situate the pilot experiences within the wider context of the **EU climate transition** (Figure 37).

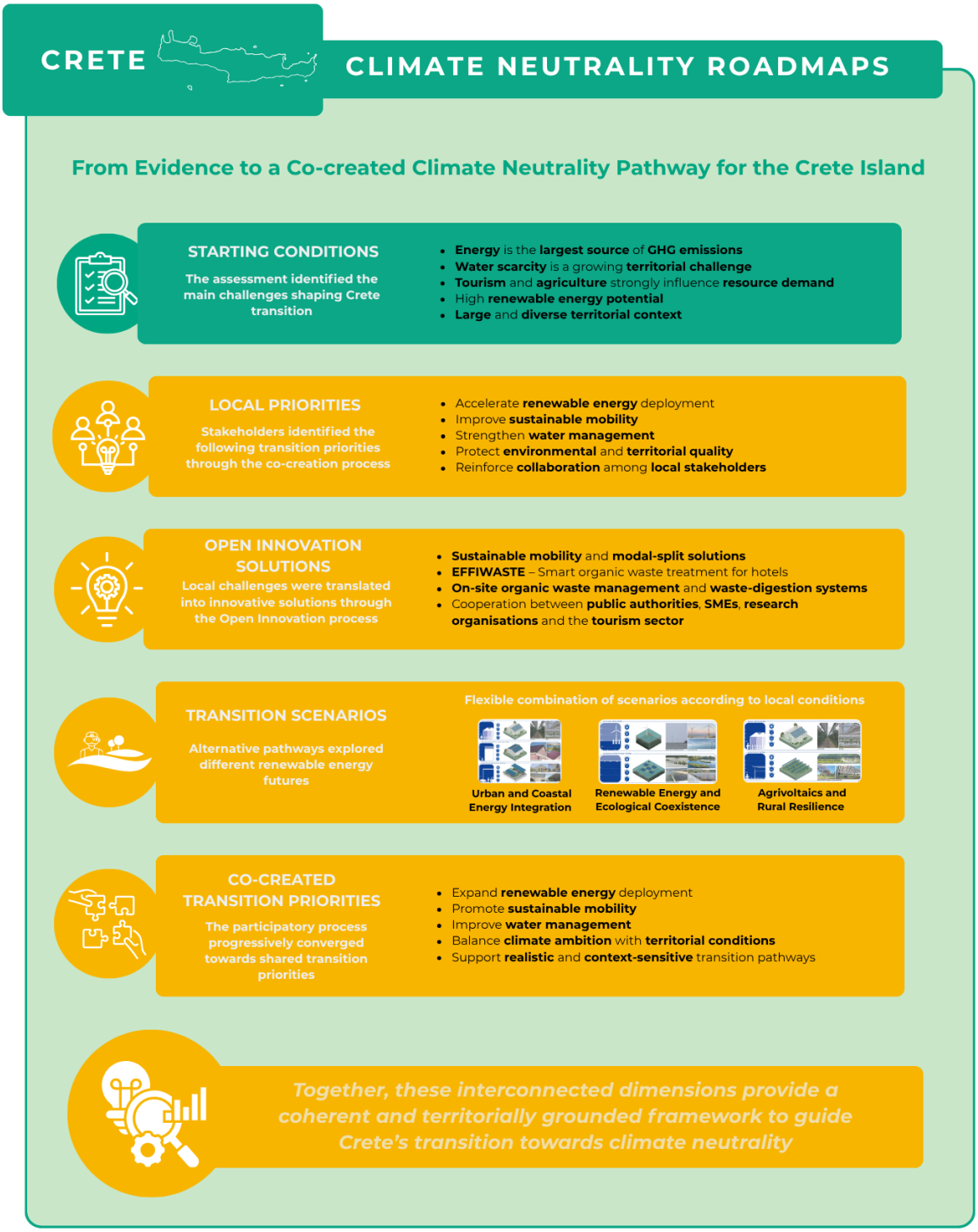

Figure 37: Climate Neutrality Roadmap at a Glance for Crete.
Summary of the co-created transition pathway, illustrating how technical evidence, stakeholder engagement, open innovation and scenario development contributed to the definition of shared transition priorities.

Policy Alignment and Strategic Relevance of the Climate Neutrality Roadmaps

Addressing the Climate Neutrality Gap for Small and Medium-Sized Islands

The Climate Neutrality Transition Roadmaps developed for the Mediterranean islands of Brač (Croatia), Elba (Italy), and Crete (Greece) within the framework of the CO2 PACMAN project, envision climate-transition pathways tailored to island territories.

Over the past years, the European Union has launched several ambitious initiatives to accelerate the climate transition of its territories, including the **EU Mission on Climate-Neutral and Smart Cities**. However, many island territories remain outside the direct scope of these initiatives, which are primarily focused on large urban areas with large populations. As a result, numerous Mediterranean islands face structural challenges in accessing policy frameworks, governance support, and visibility currently available to larger urban territories participating in EU climate-neutrality initiatives.

Recent EU policy discussions increasingly highlight the need for a more strategic and coordinated approach to addressing the specific challenges faced by island territories, reinforcing the importance of territorially tailored transition processes.

In this context, the CO2 PACMAN project addresses the need for approaches specifically tailored to **small and medium-sized island territories**, placing them at the center of climate transition planning. Unlike major metropolitan areas, many island territories operate with limited administrative capacity, fragmented governance structures, seasonal economic pressures, and constrained access to technical and financial resources. Through the development of Climate Neutrality Transition Roadmaps for Brač, Elba, and Crete covering the **2030–2050 timeframe**, the project identifies practical pathways through which island territories can contribute to the broader European climate neutrality objective.

The Roadmaps, therefore, complement existing European initiatives by expanding climate transition planning beyond major urban centers and tailoring it to the specific territorial conditions of island regions. In doing so, they support the objectives of the **European Climate Law (Regulation EU 2021/1119)**, which establishes the EU commitment to achieving climate neutrality by 2050 and reducing greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. In this way, the Roadmaps help bridge the gap between EU policy ambitions and the practical realities of climate-transition planning in island territories.

The Roadmaps also contribute to the broader objectives of two major European Union missions. First, they support the **EU Mission on Climate-Neutral and Smart Cities'** ambitions by exploring climate neutrality pathways for territories not formally included in the mission's current scope. Second, they contribute to the objectives of the **EU Mission on**

Adaptation to Climate Change, as the transition scenarios developed for the islands explicitly consider climate resilience and address environmental vulnerabilities typical of Mediterranean island ecosystems.

Mediterranean islands face a range of climate-related risks, including extreme heat waves, water scarcity, biodiversity loss, and coastal erosion. Addressing these risks requires climate strategies that combine mitigation and adaptation measures. The Climate Neutrality Roadmaps developed for Brač, Elba, and Crete demonstrate that **climate neutrality and climate resilience cannot be addressed separately**. Renewable energy deployment, ecosystem restoration, sustainable mobility, water management, and nature-based solutions emerged across the three islands as mutually reinforcing components of long-term transition strategies.

The experience of Brač, Elba, and Crete demonstrates that climate neutrality cannot be achieved through a single standardised model. Instead, transition pathways must be adapted to local environmental conditions, governance capacities, socio-economic structures, and community priorities.

Evidence-Based and Participatory Climate Transition Planning

A central component of the CO2 PACMAN methodological framework is the development of **greenhouse gas (GHG) balances** for each pilot island. These balances follow the **2006 IPCC Guidelines for National Greenhouse Gas Inventories and the 2019 Refinement**, covering key sectors such as **energy production and consumption, transportation, waste management, agriculture, and carbon sinks**. This evidence-based approach allows local authorities to identify the main emission sources and better understand the structural drivers shaping the islands' emissions profiles.

Building on this analytical foundation, the project also applied a **scenario exploration approach** that allows stakeholders to analyse how different policy options influence the greenhouse gas balance of the islands. Measures related to **renewable energy deployment, energy efficiency improvements, mobility transitions, land-use strategies, and behavioural changes** can be explored within a structured decision-support environment.

In parallel, the development of the Roadmaps was supported by a **participatory governance process** that directly involved local Pas and stakeholders in identifying transition priorities. Activities such as the **Rooting Labs**, the **"Island I Would Like" Labs**, and the **Youth Think Tanks** created structured spaces for dialogue between public authorities, experts, local businesses, civil society, and younger generations. These initiatives enabled communities to contribute their perspectives on the future of their islands and to participate in discussions of possible climate transition pathways.

The project also explored the use of **digital and interactive tools** to support this process

and make climate transition planning more accessible.

By combining **scientific analysis, participatory dialogue, and digital engagement tools**, the approach strengthened both the **ownership** and the **democratic legitimacy** of the transition strategies developed for the pilot islands.

Integration with EU Climate and Energy Policy Frameworks

Although the Climate Neutrality Transition Roadmaps mainly serve as territorial planning tools for island contexts, their structure closely aligns with the broader **European Union climate and energy policy framework**.

The Roadmaps use an integrated approach that covers several key sectors, including energy, transport, buildings, waste management, agriculture, and land use. The Roadmaps adopt a systemic approach consistent with the **European Green Deal's transformation logic** and can support the implementation of several European Union legislative packages.

Within this framework, the renewable energy scenarios outlined in the Roadmaps support the objectives of the **revised Renewable Energy Directive (RED III)** and the **REPowerEU Plan**, particularly regarding decentralized deployment of renewable energy and the formation of energy communities. This is particularly relevant for the renewable-energy scenarios developed for Brač, Elba, and Crete, which emphasise distributed renewable-energy systems, community participation, and territorial integration.

Energy efficiency measures align with the **recast Energy Efficiency Directive**, particularly regarding improvements to building performance and energy efficiency in the public sector.

Emission-reduction strategies in non-ETS sectors are consistent with the objectives of the Effort Sharing Regulation, while land-use-related strategies align with the revised **LULUCF Regulation** and elements of the **Common Agricultural Policy (CAP)**. This alignment is particularly visible in the emphasis placed on conservation agriculture, ecosystem restoration, carbon sinks, and nature-based solutions across the three island pathways.

In the transport sector, the proposed transition strategies reflect the priorities outlined in the **Sustainable and Smart Mobility Strategy** and the broader connectivity objectives of the **Trans-European Transport Network (TEN-T)** policy.

Through this integrated approach, the Climate Neutrality Transition Roadmaps demonstrate how European climate and energy policy objectives can be translated into territorial planning strategies adapted to the specific conditions of Mediterranean island territories.

At the same time, the diversity of EU sectoral policies and funding instruments can create fragmented implementation environments for island territories. Integrated approaches that combine climate, energy, mobility, and territorial planning dimensions can therefore

help improve policy coherence and strengthen the effectiveness of local transition strategies.

Relevance within the Euro-Mediterranean Context

Beyond its direct application to the pilot islands, the methodological framework developed through the CO2 PACMAN project is also broadly relevant to other Mediterranean island territories facing similar structural challenges.

Mediterranean islands often share common characteristics, including a strong dependence on imported energy resources, economic seasonality linked to tourism, limited land availability, and increased vulnerability to climate change impacts. These conditions require transition strategies that are both territorially grounded and adaptable to complex socio-economic dynamics. These challenges were consistently reflected across the three pilot islands, although their relative importance varied depending on local environmental, economic, and governance conditions.

In this context, the pilot islands of **Brač, Elba, and Crete** serve as practical testing grounds for exploring climate neutrality pathways suited to Mediterranean island territories. The experiences generated through the project contribute to a broader understanding of how European climate policy objectives can be translated into locally grounded transition strategies adapted to the environmental and socio-economic conditions of island regions.

The insights gained from the pilot islands thus provide a crucial foundation for identifying common enabling factors, barriers, and opportunities for the climate transition in Mediterranean island territories. The next section builds on these experiences to highlight the main lessons learned from developing and implementing the Climate Neutrality Transition Roadmaps.

While the three islands share several structural challenges, the Roadmaps demonstrate that **there is no single pathway to climate neutrality. Instead, transition strategies must be adapted to local territorial characteristics, governance capacities, economic structures, and community priorities**.

Beyond the development of island-specific transition pathways, **the experience** of Brač, Elba, and Crete **also provides broader insights into how climate neutrality strategies can be structured, governed, and implemented at the local level.**

Strategic Insights from the Pilot Islands

The development of **Climate Neutrality Transition Roadmaps** for Mediterranean islands highlights several strategic insights into the relationships among **greenhouse gas accounting, policy design, stakeholder engagement, and implementation capacity**. These insights build on the practical experience gained through the roadmap development process across the pilot islands and reflect the challenges and opportunities encountered when translating climate objectives into territorially grounded strategies.

The experiences developed in Brač, Elba, and Crete further demonstrate how island transition pathways are strongly influenced by landscape dynamics, participatory processes, implementation capacity, and local perceptions regarding environmental transformation.

Linking Emissions Accounting with Climate Action Planning

One key insight from the roadmap experience is the importance of **linking greenhouse gas inventories to concrete policy planning processes**. While local GHG inventories are widely recognised as essential tools for identifying emission sources and monitoring mitigation progress, in many cases they remain **analytical exercises that are insufficiently connected to decision-making processes**.

The roadmap development process demonstrates that **emissions accounting, complemented with the estimates of the decarbonization ability of possible policies,** can serve as a **decision-support instrument**, enabling local administrations to identify priority sectors, evaluate alternative mitigation options, and structure transition pathways grounded in measurable outcomes. When integrated into planning processes, GHG inventories provide a shared analytical foundation for **evidence-based climate governance**. Within the pilot islands, this analytical foundation supported the identification of sector-specific priorities in renewable energy, mobility, landscape transformation, and resource management, helping stakeholders connect emissions data to concrete territorial transition options.

Complementarity of Existing Climate Governance Frameworks

The pilot experiences also highlighted how different governance and accounting frameworks can play **complementary roles within local climate-transition processes**. Different methodological approaches contribute uniquely to the development of local climate strategies.

The roadmap experience demonstrated that **different governance and accounting approaches can play complementary roles within local climate-transition processes**.

Analytical consistency, policy integration, **participatory planning, and transparency mechanisms all contribute to strengthening the operational capacity of local administrations and improving the coherence of transition pathways**.

Data Availability as a Structural Constraint for Local Climate Governance

The roadmap development process also underscored the importance of robust **data infrastructure** for effective climate governance. In many territorial settings, the preparation of reliable GHG inventories remains constrained by **fragmented data ownership, uneven technical capacity, and limited access to consistent activity data**. It is important to note that **the effectiveness of decarbonization policies can be estimated only if the GHG inventory is made "bottom-up", i.e. using local data,** not redistributing data from regional or national averages.

These limitations reduce the usefulness of inventories in operations and make it harder for local governments to identify mitigation priorities and assess policy effectiveness. Therefore, strengthening **data governance systems, information-sharing mechanisms, and local technical capacity** is essential to successful climate transition strategies.

The pilot experiences also highlighted that fragmented data availability and uneven technical capacity may limit the operational use of climate inventories, particularly in smaller island territories with constrained administrative resources.

The Role of Participatory and Multi-Level Governance

Across the pilot islands, the roadmap development process also demonstrated the importance of **participatory governance and multi-level coordination** in shaping climate-transition strategies. Transition pathways require aligning **local governments, infrastructure providers, citizens, research institutions, and private stakeholders**, and ensuring consistency with regional, national, and European policy frameworks.

The pilot islands also highlighted the importance of addressing potential NIMBY (Not In My Back Yard) reactions when planning climate transitions. While communities may broadly support **climate-neutrality objectives**, specific interventions can raise concerns about **landscape impacts, environmental quality, or local livelihoods. Participatory approaches, co-creation activities, and visualisation tools** can help anticipate these concerns and support more widely shared transition pathways.

Participatory processes enable territories to incorporate **local knowledge, priorities, and social acceptance** into the design of transition strategies. **Across the three pilot islands**, participatory activities such as the AskyourcitizenonCaN survey, Vox Populi interviews, The Island I Would Like Labs, and the Youth Think Tank **demonstrated how climate neutrality becomes more tangible and discussable when communities are directly involved in**

exploring future transition scenarios.

Meanwhile, coordination across governance levels ensures that local initiatives stay aligned with wider climate goals and policy frameworks.

From Emissions Inventories to a Policy Cycle

The pilot experiences further demonstrated that climate action becomes more operational when structured as a continuous policy cycle **linking emissions assessment, target setting, implementation, monitoring, and policy adjustment**.

Within this approach, **baseline greenhouse gas inventories** provide the analytical foundation for defining **mitigation targets** and identifying priority intervention sectors. These targets are subsequently translated into **operational policies and action plans**, which are implemented and then evaluated through updated **emissions monitoring**.

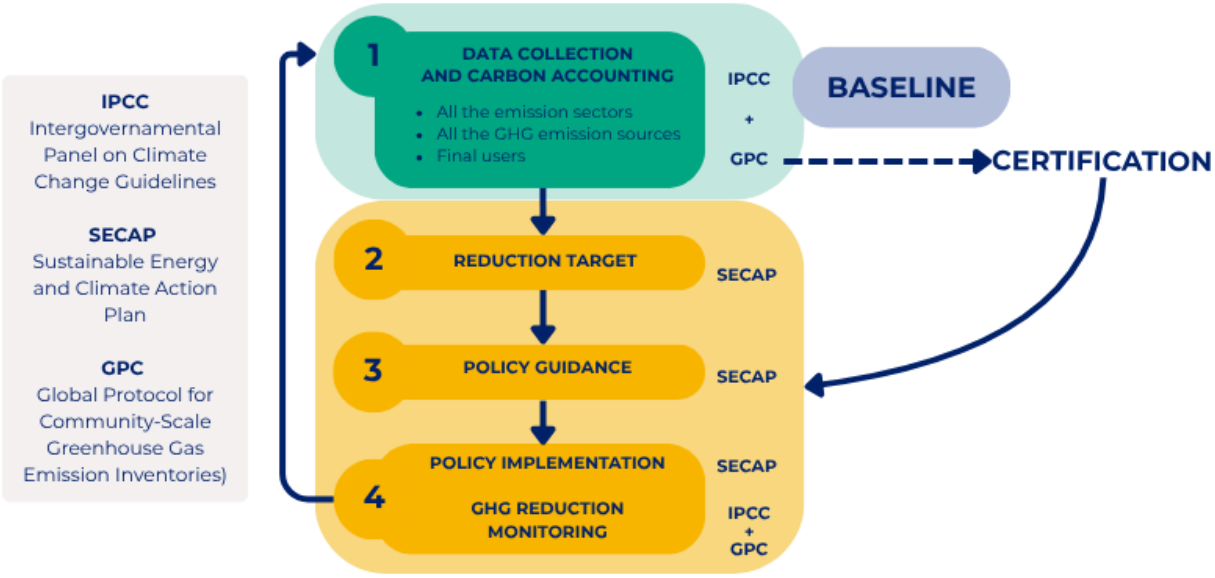

Figure 38: Linkage between GHG accounting frameworks (IPCC, GPC, SECAP) and local climate policy planning processes

One key insight from the project is the importance of linking greenhouse gas inventories to **feasible policy planning processes**[1], as illustrated in **Figure 38**. This link requires an alignment between emissions accounting framework and policy evaluation cycles. Different international GHG accounting standard, such as IPCC, Global Protocol for

[1] For a methodological discussion on how GHG accounting frameworks (IPCC, GPC, SECAP) can be linked to sub-national climate planning and decision-support systems, see Tropea et al. (2026), *From GHG Inventories to Climate Management: Aligning IPCC Guidelines, SECAP Cycles and GPC Scopes for Sub-National Governance* https://doi.org/10.1016/j.enex.2026.100023

Community-Scale (GPC), and Sustainable Energy and Climate Action Plan (SECAP) can shape how emissions data are interpreted and translated into mitigation priorities. Connecting emissions accounting with policy prioritisation and implementation is essential, as it supports systematic monitoring and, in some cases, external recognition or third parties certification of local climate commitments. How emissions are structured and categorised directly affects local administrations' capacity to assess policy impacts and compare alternative decarbonisation pathways.

By linking **emissions data, policy design, implementation, and monitoring**, this iterative structure enables local administrations to **assess policy effectiveness, adjust mitigation strategies over time, and progressively strengthen climate policy implementation.** The pilot experiences also demonstrated the importance of **complementing analytical assessment with participatory simulation tools**, immersive visualisation environments, and spatial scenario exploration processes capable of supporting more informed territorial discussions regarding climate-transition strategies.

Overall, these strategic insights demonstrate how climate neutrality planning for island territories requires the **combination of analytical assessment, participatory governance, implementation capacity, spatial exploration, and long-term policy coordination**. The experiences developed through Brač, Elba, and Crete therefore provide **operational insights that may support other Mediterranean islands and coastal territories in developing locally grounded climate-transition processes**.

From Pilot Islands to Wider Mediterranean Application

The development of the **Climate Neutrality Transition Roadmaps for Brač, Elba, and Crete** demonstrates how locally grounded transition strategies can be developed by integrating **analytical tools, participatory processes, and policy-focused planning methods**. While each roadmap highlights the specific **territorial, institutional, and socio-economic features** of the pilot islands, the overall approach provides a framework to guide climate transition efforts in other **islands and coastal areas**.

A key factor in broader adoption is the **integrated structure of the roadmap creation process**. The methodology combines **greenhouse gas accounting**, **policy scenario development**, **spatial analysis**, **stakeholder involvement**, and **innovation-driven collaboration** to translate climate neutrality objectives into territorially grounded transition pathways. Instead of relying on a single analytical tool or governance mechanism, the approach integrates multiple components into a cohesive planning framework to support **local decision-making**.

The pilot experiences demonstrated that combining **emissions accounting, participatory governance, spatial planning, immersive visualisation**, and **implementation-oriented actions** can help territories develop more operational and territorially grounded climate-transition strategies.

At the same time, the pilot experiences highlight that climate-transition pathways need to **remain transferable** to the environmental, infrastructural, governance, and socio-economic conditions of different island territories. **Environmental conditions, infrastructure systems, governance structures, and socio-economic factors** differ greatly across island regions. For this reason, the roadmap approach should not be seen as a **static model to copy**, but as a **transferable planning framework** that supports **locally tailored transition processes**.

Overall, the experiences of Brač, Elba, and Crete demonstrate how the **CO2 PACMAN Toolkit** can be operationalised through territorially grounded **Climate Neutrality Transition Roadmaps**, combining **analytical precision**, **participatory governance**, **spatial planning**, and **practical implementation tools** within a unified transition framework. By linking **emissions assessment**, **stakeholder dialogue**, **technological innovation**, and **financial viability**, the roadmap approach provides a structured foundation that other island and coastal regions across the Euro-Mediterranean area can adapt to support their own climate transition efforts.

The **modular and implementation-oriented structure** of the roadmap process also strengthens its capitalisation potential, enabling individual components, including **participatory formats**, **simulation tools**, **immersive visualisation environments**, and **innovation-driven collaboration mechanisms,** to be transferred, adapted, and reused across different Mediterranean territorial contexts.

Added Value, Transferability, and Legacy of CO2 PACMAN

The development of the **Climate Neutrality Transition Roadmaps** for Brač, Elba, and Crete demonstrates the practical value of the methodological framework developed within the **CO2 PACMAN project**. Rather than producing isolated analytical outputs, the project has developed an **integrated, implementation-oriented approach that connects greenhouse gas accounting**, **participatory governance**, **spatial planning**, **technological innovation**, and **financial implementation pathways** within territorially grounded climate-transition processes for island territories.

A central element of this approach is the **CO2 PACMAN Toolkit**, originally designed to support the assessment and co-creation of climate neutrality scenarios. While the Toolkit provides the analytical and participatory foundation for the process, the Roadmaps demonstrate how this framework can be translated into **territorially grounded transition pathways** that combine technical evidence, stakeholder dialogue, and implementation-oriented planning.

Unlike conventional climate planning tools that focus primarily on emissions' inventories or technical mitigation measures, the CO2 PACMAN Toolkit integrates governance, stakeholder engagement, landscape-sensitive planning, innovation ecosystems, and visual communication tools within a single operational methodology. The CO2 PACMAN approach provides clear added value by integrating **scientific assessment, participatory engagement, digital modelling, immersive visualisation tools, and open innovation mechanisms** within a single methodological framework. This integration helps bridge the gap between **emissions analysis and policy implementation**, enabling local communities to understand their emissions profiles, explore alternative transition scenarios, and co-design realistic decarbonization strategies grounded in territorial perspectives and their local environmental and socio-economic context.

Through its **modular architecture**, reliance on **IPCC-based methodologies**, and adaptable stakeholder engagement formats, the approach demonstrates strong **transferability potential** beyond the specific pilot islands. The experiences of Brač, Elba, and Crete illustrate how the methodology can be applied across territories with different scales, governance arrangements, and socio-environmental characteristics while maintaining methodological consistency and comparable results. The pilot experiences further demonstrate that transferability does not imply replicating identical solutions, but rather adapting common methodological principles to different territorial, institutional, and socio-economic conditions.

The CO2 PACMAN approach contributes to broader **European and Euro-Mediterranean climate policy objectives** by offering a practical pathway for local territories to operationalise climate neutrality strategies. By integrating analytical assessment,

participatory processes, spatial exploration, and financial feasibility considerations, the framework provides a structured reference for territories seeking to translate climate ambition into actionable transition pathways.

As the project moves forward, experiences from pilot islands provide a foundation for **continued refinement, shared learning, and cross-territorial cooperation**. Beyond the project duration, the legacy of CO2 PACMAN can be understood across three complementary dimensions: **a methodological legacy**, represented by the CO2 PACMAN Toolkit and its integrated approach to climate-neutrality planning; **a knowledge legacy**, reflected in the experiences, lessons learned, technical guidance, and implementation insights generated through the pilot activities; and **a community-engagement legacy**, embodied in the stakeholder networks, participatory practices, and cooperation mechanisms established throughout the project.

The CO2 PACMAN legacy also encompasses the digital tools, collaborative platforms, immersive visualisation environments, stakeholder networks developed throughout the project. Together, these resources support learning, capacity building, cooperation, and knowledge exchange among public authorities, researchers, businesses, civil-society organisations, and local communities interested in advancing climate-neutrality pathways.

Through future adaptation and application, the CO2 PACMAN tools and methods can continue to support territories in designing locally grounded, scientifically robust, and socially inclusive transition pathways. The CO2 PACMAN approach should therefore be understood not as a fixed methodology but as an **evolving framework** that supports territories in navigating the transition toward climate neutrality in a scientifically grounded, inclusive, and implementation-oriented manner.

Conclusions and Strategic Outlook

The Climate Neutrality Transition Roadmaps developed within **CO2 PACMAN** demonstrate how Mediterranean islands can translate climate ambitions into **place-based, operational transition processes**. By integrating **greenhouse gas accounting, landscape scenario analysis, participatory governance, innovation-oriented collaboration, and financing perspectives**, the Roadmaps provide an integrated framework that supports both strategic planning and long-term implementation.

Experiences developed for **Brač, Elba, and Crete** further show that climate-neutrality planning cannot rely exclusively on technical assessments or mitigation targets. Effective transition processes instead require a combination of analytical evidence, local knowledge, collective participation, institutional coordination, and implementation capacity. In this respect, the Roadmap process helped transform collectively imagined visions of transition into more concrete and agreed implementable trajectories tailored to the environmental, social, and governance characteristics of each island territory.

At the same time, the pilot experiences highlighted that the long-term **effectiveness of climate-transition strategies depends strongly on the capacity to connect strategic priorities with realistic financing opportunities, governance mechanisms, and institutional support structures**. The financing pathways explored within the Roadmaps therefore represent an important step toward operationalizing locally co-created priorities and strengthening the feasibility of future implementation processes.

Beyond the specific pilot territories, the experiences developed through CO2 PACMAN also demonstrate **strong transferability potential** for other Mediterranean islands and coastal territories facing similar environmental, governance, and decarbonisation challenges. This transferability does not rely on replicating identical solutions but on the adaptability of the methodological approach itself. **The modular structure of the Roadmaps**, combining emissions accounting, participatory governance formats, spatial analysis, innovation-oriented collaboration, and implementation planning, **allows territories with different institutional capacities, territorial scales, and socioeconomic conditions to adapt individual components to their own transition priorities and local needs.**

Experiences developed through **CO2 PACMAN** may also create important complementarities with other Euro-Mediterranean initiatives focused on **sustainable finance** and **climate-transition investments**, such as the INFIRE Project, which specifically addresses financing mechanisms that support the climate and energy transition. Strengthening these complementarities may further reinforce the **implementation potential**, **scalability**, and **long-term capitalisation** of the approaches developed within the project.

The Roadmaps also contribute to **broader sustainable development and climate**

governance objectives by supporting integrated actions aligned with several **Sustainable Development Goals (SDGs)**, particularly those on affordable and clean energy, sustainable cities and communities, and climate action. At the same time, the methodological approach developed through CO2 PACMAN remains strongly aligned with the principles underpinning the **Covenant of Mayors Climate and Energy Framework** and the development of **Sustainable Energy and Climate Action Plans (SECAPs)**, particularly in terms of integrated emissions assessment, stakeholder participation, local climate governance, and implementation-oriented transition planning. More broadly, the Roadmaps are consistent with key European and Euro-Mediterranean policy frameworks supporting climate neutrality, territorial resilience, and integrated local governance, including the **European Climate Law**, the **EU Adaptation Strategy**, and the **Pact for the Mediterranean**.

Beyond the production of strategic planning documents, the **legacy of CO2 PACMAN** also lies in the **development of transferable participatory approaches, collaborative governance practices, and innovation-oriented tools to support future climate-transition initiatives across Mediterranean** islands and coastal territories. In this sense, the Roadmaps should be understood as adaptable frameworks that support long-term, place-based transition processes.

Looking ahead, the experiences developed through **CO2 PACMAN** suggest that **climate neutrality for Mediterranean islands** cannot be approached as a purely technical objective but rather **as a long-term territorial transformation process requiring continuity, cooperation, and collective ownership.** From this perspective, the Roadmaps developed through the project provide not only operational planning tools but also **a shared foundation for future climate-transition pathways across the Mediterranean**.

Tables and figures

List of figures

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