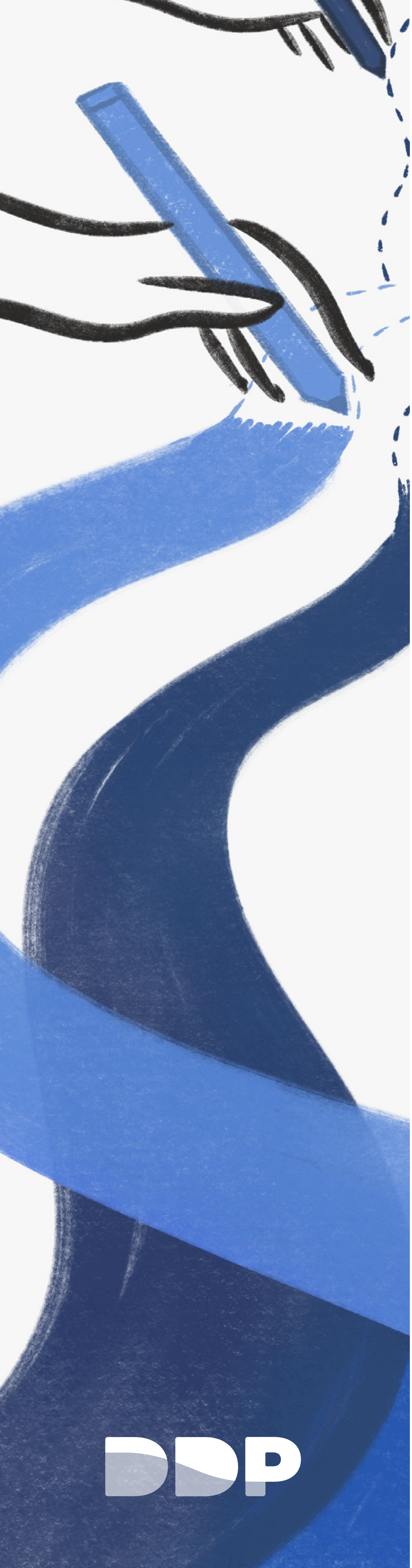

COSTA RICA
FIRST MOVERS BY DESIGN: CLIMATE LEADERSHIP BEYOND EMISSIONS

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Costa Rica often defies conventional metrics of power, reminding the world that climate ambition is not reserved for the largest economies. Its leadership on climate and environmental protection stands out not only in emissions figures, but in the depth of its cultural values, public awareness, and institutional commitment to sustainability.

Costa Rica's leadership is also rooted in a long-standing national ethos. The country's environmental legacy, initiated with renewable energy deployment and early reforestation programs in the 1950s and later gaining strong political traction in the 1990s (Blum, 2008), has yielded tangible results: nearly 100% renewable electricity (IRENA, 2025; ICE, 2020) and approximately 60% forest cover (MINAET, 2011). These achievements represent more than technical milestones; they embody a national identity deeply shaped by ecological responsibility (Estado de la Nación, 2023, pp. 21–23).

The trajectory of Costa Rica's greenhouse gas emissions reinforces the environmental ethos. Between 1990 and 2021, while absolute emissions increased, the economy expanded much faster, cutting emissions intensity by half. Agriculture, once the dominant source, has steadily declined, while energy has become the principal contributor, driven above all by transport, which now accounts for nearly two-thirds of energy-related emissions. At the same time, renewable electricity has enabled an 80% reduction in power sector emissions since 1990, demonstrating how structural transformation and clean energy deployment have tempered overall growth in emissions.

Moreover, the participatory dynamic resonates with Costa Rica's broader climate trajectory: a country that has consistently acted ahead of the curve, embracing ambitious policy measures even in the absence of precedent or guaranteed outcomes. It can be said that rather than waiting for global consensus, Costa Rica has often chosen to lead from the front, demonstrating that climate ambition is as much about political will and societal engagement as it is about emissions metrics.

However, acting without full certainty is not a sign of carelessness, but of leadership. Costa Rica has opted to advance climate policy pragmatically, building what is needed along the way, because delaying action until conditions are ideal is no longer viable, not when it comes to climate change. This reflects a political and societal understanding that climate ambition requires both speed and resolve.

This chapter sets the stage by outlining Costa Rica's national climate governance context, the modelling tools that inform policy, and the dynamics of policymaking and implementation. It also previews the challenges and impacts that frame the country's climate action, providing the foundation for the analysis and conclusions that follow.

CLIMATE CHANGE CONTEXT IN COSTA RICA

Greenhouse gases Emissions Trajectories

Costa Rica's emissions trajectory between 1990 and 2021 reflects both notable progress and remaining challenges. During this period, the economy grew by almost 250 percent, while emissions increased by about 180 percent, reducing emissions intensity by half *(Gobierno de Costa Rica, 2024)*. This relative decoupling indicates that the country has been able to expand economic activity at a faster pace than emissions growth, a meaningful outcome in the regional context. However, the continued rise in absolute emissions highlights the limits of this progress and the need for deeper structural changes.

The composition of emissions has shifted over time. In 1990, agriculture was the main source, but energy has since become the dominant contributor, driven largely by transport, which today represents nearly two-thirds of energy-related emissions. Waste has remained broadly stable at 15–20 percent of the total, while industrial processes have nearly doubled their share from 6 to 11 percent. Agricultural emissions, in contrast, have declined by about 20 percent since 1995, reducing their overall weight in the national profile *(Gobierno de Costa Rica, 2024)*. These developments point to a transition in Costa Rica's climate challenge, moving away from land-use pressures toward energy and industry, where mitigation is often more complex.

Electricity generation stands out as an exception. Owing to Costa Rica's reliance on hydropower and other renewable sources, emissions from power generation are more than 80 percent lower than in 1990, despite significant economic expansion *(Gobierno de Costa Rica, 2024)*. This outcome has positioned renewable electricity as a cornerstone of the country's decarbonization strategy, laying the groundwork for further progress through the electrification of transport. At the same time, the transport sector continues to present the most pressing challenge: it has remained consistently above 59 percent energy emissions and has grown faster than other subsectors. Without major transformations in mobility systems, through expanded public transport, electrification, and modal change, emissions will remain on an upward trend despite advances elsewhere.

In sum, the emissions trajectory illustrates both Costa Rica's capacity for leadership and the areas where further action is required. The country has already demonstrated its ability to align growth with sustainability through renewable energy deployment and reduced agricultural pressures. Yet absolute reductions will depend on extending this leadership into sectors such as transport and industry, ensuring that the gains achieved so far are consolidated into longer-term transformations *(Gobierno de Costa Rica, 2024)*.

Addressing these dynamics requires policy instruments that are both technically robust and institutionally grounded. This is why modeling tools and evidence-based planning have become central components of Costa Rica's climate governance, while national governance structures have been deliberately strengthened to lead the country along its decarbonization path.

National Governance of Climate Change Policies

Costa Rica's high-level ambition is reflected not only in national plans and policy instruments, but also in the evolving practices of climate governance, particularly in the way institutions are leveraging tools and technologies to inform decisions and accelerate implementation.

Over the past decade, Costa Rica has increasingly integrated data-driven approaches, modeling platforms, and digital systems into its climate governance, enabling more precise planning, monitoring, and cross-sectoral coordination. These innovations have helped bridge the gap between long-term goals and operational realities, reinforcing a governance model that is strategic, adaptive, and evidence based.

To do so, institutions have played a decisive role in translating this vision into action, allowing Costa Rica's national climate governance to be anchored to a robust institutional framework that ensures both strategic direction and participatory processes. At the core is the *Dirección de Cambio Climático* (DCC or Climate Change Directorate), created in 2010 within the Ministry of Environment and Energy (MINAE), which acts as the technical authority responsible for coordinating climate policy, developing the National Decarbonization Plan, and overseeing implementation of the country's Nationally Determined Contribution (NDC). The DCC has led coordination efforts across ministries, sectors, and territories, engaging hundreds of organizations and local governments through initiatives such as the carbon neutrality program (MINAE, 2020).

Notably, climate change governance in Costa Rica goes beyond institutional structures, as the country has a long-standing tradition of stakeholder consultations involving civil society, academia, local governments, and community representatives. First, those processes also ensure broad ownership, allowing diverse actors to shape the design, prioritization, and monitoring of climate actions. However, these consultations are not limited to validating policy tools; they also provide critical inputs to the actions of institutions and organizations, enabling the collection of data and the validation of assumptions that often arise when building tools in contexts where information is incomplete or missing. This combination of institutional leadership, inter-sectoral coordination, and participatory engagement builds consensus and continuity in the national agenda.

Understanding how this governance framework translates into real-world outcomes requires looking at Costa Rica's elaboration of public policies, which offers a clear picture of both the country's achievements to date and the challenges that continue to shape its climate agenda.

Development of modeling tools to guide public policy elaboration

As global momentum for decarbonization intensifies, countries are increasingly turning to science-based tools and financial mechanisms to operationalize climate ambition. For Costa Rica, advancing the climate agenda alongside other development priorities revealed the need for robust analytical tools to support long-term planning and policy coherence, while also presenting an opportunity for institutional and technical innovation.

In response, the country embraced specialized modeling systems, often developed in collaboration with academic and international partners, to assess complex decarbonization scenarios and support evidence-based decision-making.

The first of these tools, the TIMES-CR model, was introduced in 2017 with support from the World Bank's Partnership for Market Readiness (PMR) program. It provided the basis for the country's first quantitative decarbonization pathway analysis and directly informed the design of Costa Rica's National Decarbonization Plan (World

Bank, 2021). Costa Rica's initial development of its energy sector model significantly influenced the formulation and implementation of the National Decarbonization Plan, launched in 2019. Building on this experience, Costa Rica transitioned to more flexible and transparent tools such as the Open-Source Energy Modeling System for Costa Rica (OSeMOSYS-CR) and, later, the Climate, Land, Energy, and Water (CLEW-CR) framework. The development of OSeMOSYS-CR, focused initially on the energy sector, played a pivotal role in refining the NDP and supporting its implementation (UCR & KTH, 2020). The CLEW model expands upon the initial energy sector model by providing a more holistic view, ensuring cross-sectoral coherence and enabling more strategic decision-making.

Costa Rica's innovative use of the CLEW framework has not only reshaped sectoral governance but also laid the foundation for broader institutional integration. Its influence is evident in the development of the country's third Nationally Determined Contribution (NDC 3.0), where CLEW continues to provide a strategic lens for aligning climate action with national development priorities. This integration reinforces Costa Rica's leadership in climate policy and supports clear, evidence-based pathways toward achieving both national and international sustainability targets.

Implementation challenges

Costa Rica's path to decarbonization also faces significant challenges. A first concern is aligning management instruments, international commitments, national plans, and public policies to avoid overlap, duplication, and inefficient use of public funds. The parallel existence of the National Strategic Plan 2050 (PEN 2050) from MIDEPLAN and the National Decarbonization Plan 2018–2050 highlights the need for robust inter-institutional coordination so that actions are optimized and priorities are aligned across public entities and relevant stakeholders, including the private sector and civil society (Contraloría General de la República, 2024). To address this, the government instituted a participatory design process using the same actors responsible for both plans, ensuring that all relevant institutions, private sector representatives, and civil society voices coordinated under a unified platform.

A second, cross-cutting challenge is mainstreaming climate change across the entire public administration. Mitigation and adaptation are not the sole responsibility of MINAE or the Climate Change Directorate (DCC); they require political leadership, internal and external awareness-raising, and explicit integration of climate objectives into strategic and operational planning, including clear responsibilities, staffing, and dedicated budgets (Contraloría General de la República, 2024). To meet this need, the government implemented participatory processes during strategy formulation, embedding climate considerations across ministries and agencies so that the same actors responsible for policy planning also co-design targets, allocate resources, and monitor progress within their institutional mandates.

Significant gaps remain in measurement, reporting, and verification (MRV). Many projects lack methodologies to assess their impact, and databases are often incompatible with indicators used in national planning instruments. Many projects lack robust methodologies to assess their impact, and databases are often incompatible with indicators used in national planning instruments. This undermines traceability, transparency, and accountability. Strengthening SINAMECC was and remains essential to consolidate information, monitor progress, and inform timely, data-driven decisions (Contraloría General de la República, 2024).

Moreover, the impact of the planning frameworks has extended well beyond the energy or land-use sectors, shaping broader governance processes and policy continuity across electoral cycles. Although subsequent administrations have demonstrated varying levels of political commitment to climate action, the robust institutional embedding, technical credibility, and cross-sectoral support for these models have compelled even less ambitious governments to maintain and operationalize them. Their enduring presence in national planning reflects not only their technical soundness, but also the widespread recognition of their value by public agencies, civil society, and international partners.

Finally, despite high levels of public awareness, environmental issues often remain at the margins of daily social and political life. Surveys indicate that most Costa Ricans recognize the importance of climate change, but engagement often stays at the level of individual practices rather than collective action or political advocacy. However, Costa Rica's climate ambition is increasingly reflected in the evolving landscape of civic engagement, particularly through the growing visibility of youth networks and civil society organizations advocating for sustainable urban development, low-carbon transportation, and environmental justice. Their involvement in national climate governance processes, such as the revision of the Nationally Determined Contribution (NDC) and the development of long-term decarbonization strategies, points to a shift toward more inclusive, participatory policy frameworks (La Ruta del Clima, 2023). While youth engagement continues to be largely centered on individual environmental practices, there is increasing emphasis on integrating collective civic participation into structured climate governance processes (Programa Estado de la Nación, 2023).

Additional effort to decarbonization

Alongside this technical evolution, Costa Rica is also fortifying its financial infrastructure to sustain climate ambition. A major milestone was the 2023 launch of the Sustainable Finance Taxonomy, developed by the Ministry of Environment and Energy (MINAE) and the General Superintendency of Financial Institutions (SUGEF), with support from UNEP and the European Union via EUROCLIMA+ (UNEP, 2023). The taxonomy defines criteria for identifying climate-aligned economic activities, helping public and private actors align investments with national mitigation, adaptation, and environmental objectives. By offering standardized tools for financial institutions, the taxonomy enhances transparency, builds investor confidence, and accelerates the scaling of green finance.

These efforts are complemented by innovative financial mechanisms. In 2024, Banco Nacional de Costa Rica (BNCR) issued the country's first blue bond in partnership with IDB Invest, raising US$50 million for marine conservation, sustainable water and waste systems, and circular economy initiatives. The bond, aligned with international sustainability standards, attracted capital from FinDev Canada and LAGreen, underscoring growing confidence in Costa Rica's environmental finance architecture (IDB Invest, 2024).

Expanding this portfolio, BNCR launched the Pura Verde program in 2025, a credit facility providing preferential financing for environmentally beneficial projects across renewable energy, clean transportation, sustainable agriculture, and water management (Banco Nacional de Costa Rica, 2025). Developed with the support of AFD and the European Union, the program applies rigorous eligibility and impact verification criteria aligned with the national taxonomy. While specific modeling tools were not disclosed, the program's design suggests the use of structured assessment methodologies to ensure consistency, transparency, and measurable environmental returns (Steer Group, 2024).

IMPACTS OF PUBLIC POLICIES ON KEY SECTORS, SOCIETY AND GLOBAL ECONOMY

Positive impacts of climate change mechanisms across key sectors

Governance reforms have strengthened the institutional foundation for policy implementation, enabling measurable progress across sectors. A key example is the Law on Incentives and Promotion for Electric Transportation (Law No. 9518, 2018), which advances electromobility through fiscal and non-fiscal measures. By underpinning the transport pillar of the National Decarbonization Plan, the law supports Costa Rica's NDC under the Paris Agreement and demonstrates alignment between domestic policy, international commitments, and early energy-sector modeling (IRENA, 2021).

Within this evolving governance landscape, the Sugarcane NAMA also stands out. Although designed for mitigation, its real innovation is the way it builds data systems and traceability into agricultural policy from the start. In the pilot phase, the full package of planned activities is implemented, and all indicators are measured to test and validate technologies that (1) raise agro-industrial productivity and (2) reduce total GHG emissions ($tCO_2e \cdot yr^{-1}$). The pilot also generates the high-quality datasets needed to calibrate the emissions model (LAICA, 2022).

That model then became the decision engine for scaling up. Using pilot data, it quantified expected abatement and productivity gains by region and technology package, set baselines, and defined adoption trajectories across the six sugarcane-producing regions. It also underpinned three feasible scaling scenarios, allowing policymakers to compare trade-offs (abatement potential, cost, and speed of adoption), allocate incentives and finance, and set realistic annual targets. As the intervention expanded, the model fed into a standardized MRV and traceability system, enabling course corrections and ensuring that the commercial rollout delivered both productivity improvements and verifiable emissions reductions (LAICA, 2022).

Finally, adaptation planning is also being reshaped by modeling innovations. Advanced tools, such as integrated vulnerability assessments and climate risk scenarios, are enabling countries to anticipate climate impacts across agriculture, infrastructure, water systems, and public health. Costa Rica has begun investing in these capabilities, reflecting a shift toward proactive and data-informed adaptation policies that guide resource allocation and build systemic resilience.

Together, these initiatives illustrate how Costa Rica is translating its climate vision into concrete, system-level interventions, combining data-driven planning, innovative finance, and institutional coordination. They also demonstrate the country's ability to anticipate global trends and respond with integrated, locally grounded solutions that reinforce its commitment to a just, resilient, and low-emission future.

Social and economic impact of the National Decarbonization Plan

Costa Rica's transition to decarbonization is planned to deliver sizable socio-economic gains. Implementing the National Decarbonization Plan (PND) yields an estimated net economic benefit of US$41 billion by 2050 (about 64% of 2019 GDP), with major contributions from the energy and transport sectors. Beyond GDP, expanded public transport would cut congestion and accidents, while lower emissions improve cardio-respiratory health. Although transport decarbonization has fiscal implications, the analysis finds these are smaller than the benefits and can be managed through smart fiscal adjustments that fairly distribute gains. International evidence also points to broad labor benefits: moving toward net-zero in Latin America and the Caribbean could create 15 million net jobs by 2030, and coupling clean energy with e-mobility could reach 35 million net jobs by 2050 (AFD, 2022).

For Costa Rica specifically, investing in renewables, sustainable mobility (electrification, public transit, active mobility), and digitalized institutions could generate 135,000 net jobs by 2050. Of these, roughly 24,000 are direct jobs in transforming activities, 70,000 are indirect through supply-chain linkages, and more than 41,000 are induced by higher household spending. The transition is also inclusive: just over 30% of these jobs would be filled by women, and about 10% by people with disabilities, migrants, or Indigenous peoples. Most employment would concentrate in commerce, clean energy production, water distribution and sanitation, education, and information and communications (AFD, 2022).

Job creation is expected to accelerate over time. In the short term (2021–2025), around 11,000 net jobs are tied to energy, transport, and education activities. This figure quintuples in the medium term (2026–2035) as large, transformative investments come online across the 3D economy. In the long term (2036–2050), consolidation and the mass uptake of electromobility could lift net job creation to about 65,000 (AFD, 2022).

Targeted policy can maximize these gains. By 2050, renewables and sanitation systems alone could add approximately 52,000 jobs; new commercial activities and business models around electromobility add approximately 27,000 and 3,000 jobs, respectively; ICT contributes approximately 14,000; and transport (public and ecotourism) adds approximately 16,000. As sectoral linkages and household consumption patterns evolve, public policy should closely monitor new value-chain connections and respond proactively, with enabling laws, standards, and well-designed incentives or subsidies, to keep the transition aligned with 3D objectives and to equitably distribute its benefits across the population (AFD, 2022).

CONCLUSIONS

Costa Rica's climate trajectory challenges traditional assumptions about what constitutes leadership in the global transition. It demonstrates that transformational change is not the exclusive domain of major economies but can also emerge from countries that are willing to lead with conviction, coherence, and creativity.

Ambition before certainty: leading by doing.

Costa Rica has repeatedly chosen to act in the absence of guarantees, setting bold decarbonization targets, piloting sectoral policies, and institutionalizing climate governance even when outcomes were not assured. This "act first, refine later" ethos reveals a national identity grounded in ecological responsibility and political courage. Rather than waiting for consensus, Costa Rica has often created the precedent.

Costa Rica's distinctiveness lies not only in its ambition, but in its investment in reducing uncertainty through knowledge. The country has embedded science into governance, developing national models, MRV systems, and integrated planning tools that enable scenario analysis, adaptive management, and transparent accountability. Science thus becomes a strategic enabler, turning deep uncertainty into informed, iterative action.

Inspired by Costa Rica's success, several Latin American countries have been expressing interest in adopting and customizing similar modeling frameworks. This trend underscores a growing regional recognition of the value of comprehensive, flexible, and integrated planning tools in enhancing governance, improving policy coherence, and effectively addressing complex climate challenges.

For example, in the Dominican Republic, the CLEW framework has been combined with Robust Decision Making (RDM) methodologies to inform long-term decarbonization strategies under deep uncertainty. This case illustrates the broader potential of integrated modeling and decision-support tools to guide resilient and adaptive climate planning across diverse institutional and socio-economic contexts (Rodríguez-Arce et al., 2021; Quirós-Tortós et al., 2024).

International cooperation support

International cooperation can accelerate Costa Rica's path to carbon neutrality by channeling concessional, results-based finance into the country's biggest near-term levers, grid resilience, zero-emission public transport, and drought-proof power, while expanding results-based forest finance to scale FONAFIFO's Payment for Environmental Services, especially in indigenous territories and biodiversity corridors. Credit lines from development banks can de-risk clean industry and build upgrades, and targeted support can scale the agriculture NAMAs. All cooperation should be tied to 2026–2028 milestones, with clear adoption targets to keep progress measurable. Over time, the goal is to transition toward a self-financing system in which early grants and concessional loan crowd in private capital and are gradually replaced by durable domestic revenue streams, so programs can sustain themselves without ongoing external support.

Alignment is the engine of transformation.

Costa Rica's experience shows that true ambition only delivers results when governance, finance, and technical planning are aligned. Its climate architecture, built on participatory planning, robust data systems, and sustainable finance mechanisms like taxonomies and blue bonds, enables the translation of long-term goals into actionable pathways. This systemic alignment enhances resilience, credibility, and investor trust, reinforcing the country's capacity to sustain its leadership role even in challenging political or economic contexts.

As the world searches for models of transformational yet grounded climate action, Costa Rica shows its strong environmental leadership and pioneering role in climate action, notably through the leadership of Christiana Figueres in achieving the Paris Agreement. The country actively participates in the UN Framework Convention on Climate Change (UNFCCC), serves as a co-leader in climate conferences, and is a member of negotiating groups like the Independent Association of Latin America and the Caribbean (AILAC) (UNFCCC, 2020).

Costa Rica's climate journey is more than a technical roadmap; it is a statement to the power of purposeful governance, societal alignment, and strategic risk-taking in the face of global uncertainty. By prioritizing ambition over delay, embedding science in decision-making, and fostering systemic coherence across sectors and scales, the country offers a living example of how small states can shape big transitions. Its leadership illustrates that climate action is not only a moral imperative but a pragmatic strategy for national development, resilience, and global influence.

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