the Carbon-Free Regions Handbook

an action guide for states, provinces, and regional governments
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Welcome to The Carbon-Free Regions Handbook
An Action Guide for States, Provinces, and Regional Governments
This handbook is organized around 30 recommendations for no-regrets actions that will help regions become carbon free. The recommendations are numbered continuously and are divided among seven sections.

About Rocky Mountain Institute
Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing.

About the Under2 Coalition and The Climate Group
The Under2 Coalition is driven by a group of ambitious state and regional governments committed to keeping global temperature rises to under 2°C. The coalition is made up of more than 200 governments that represent over 1.3 billion people and nearly 40% of the global economy. The Climate Group is the Secretariat to the Under2 Coalition and works with governments to accelerate climate action through three work streams: deep decarbonization pathway planning, scaling innovative policy solutions, and mainstreaming transparency and reporting.

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Images courtesy of iStock unless otherwise noted.
Welcome to The Carbon-Free Regions Handbook: An Action Guide for States, Provinces, and Regional Governments. We live in unprecedented times. The need for regional-scale governments—states, provinces, counties, multistate coalitions, etc.—to act ambitiously toward similar goals has never been this universal. We have also never before seen the momentum that is now arising from these same governments. The time is now, and we offer this book to accelerate those efforts.

The work we pursue today must be focused on impact. Commitments? Yes. Planning? Yes. But commitments and plans won’t solve the problem. We must take action now. “Action now” has to be our mantra. Actions vault us from a hope for tomorrow to making that vision reality. Our time and resources are always limited, so let’s put them to use where they will drive the greatest changes. As my colleagues at RMI say, if you have to choose between making plans or making progress, then make progress.

This handbook’s recommendations support that progress. They are proven. They are relevant to most state and provincial governments. They are actionable. This handbook can remove a lot of uncertainty about where to start. You know your local context. Your knowledge, combined with the recommendations provided here, will lead to impact.

Although the climate change crisis makes this work urgent, more than fear drives us. These recommendations provide a wealth of other benefits. Not only can we prevent the economic, political, and social upheaval of dramatic climate shifts, we can also create economic prosperity and improve security and resilience, all while making healthier and safer places for our families, friends, and fellow citizens to live.

When we released The Carbon-Free City Handbook at COP23 in Bonn, our aim was to create a very accessible guide that would reach the largest possible global audience. The goal is clear: we must make it easier for local governments to move great ambitions forward. RMI is proud to work with local governments that are ready to be part of the global energy transition. Thank you for taking this step forward. Thank you for leading this transition. We are relying on you, and we are also working with you, to create a future we can all be proud of.

—Jules Kortenhorst, Chief Executive Officer and Trustee, Rocky Mountain Institute

Every one of our communities is seeing and experiencing the impacts of climate change. But at this most crucial time for action, the US government has abdicated its commitment to doing its part to combat this existential threat.

But national governments are not the only ones with the responsibility—and power—to step up in this fight. When the White House announced the intention to pull the US out of the Paris Agreement, I stood up as governor of the State of Washington alongside the governors of California and New York to create the bipartisan US Climate Alliance. We’re now 17 states strong, and collectively, our states represent the third-largest economy in the world. We will do what the nation should do: reduce greenhouse gas emissions consistent with the goals of the Paris Agreement and grow a clean energy economy consistent with our spirit of innovation. I’m here to tell you that our citizens, our businesses, our cities, and our states and our regions can and will uphold America’s commitment to meaningful climate action.

We don’t have to do it alone, but we have to do it.

We wield great power in the global effort to keep the world below a 2- or 1.5-degree temperature rise. We created the Under2 Coalition to bring ambitious governments together to do this. The coalition represents more than 1.3 billion people and $30 trillion in GDP—equivalent to 17% of the global population and nearly 40% of the global economy.

The Carbon-Free Regions Handbook is all about the actions we can each take to do our part. We all have a stake in acting on climate, and we all have an enormous opportunity. My state is proof that a strong economy and a strong commitment to protecting our planet go hand in hand. Washington state consistently ranks as one of the top-performing economies in the US. Join us in taking action to stop climate change and create thriving regions at the same time.

This fight is bigger than any of us; we’re going to win because of all of us.

—Jay Inslee, Governor, State of Washington, and North American Cochair of the Under2 Coalition
I have seen what happens when governments unite to make change. It doesn’t start with everyone stepping forward at once, even though it may appear that way at times. Individual governments have to determine what they can do and decide to act. Each official has to find his or her own path to leadership.

Instead of thinking about early movers, or those that follow, let’s use the mindset that we are all movers. Let us ask ourselves: what can I do to deliver meaningful change? The grand movement happens because each government finds its own way to step forward.

Government leaders around the world are continuing to step up on climate. Big movement is happening. We see it in the Niger and Delta States of Nigeria investing in utility-scale solar. We see it in the Brazilian state of Mato Grosso, which is leading the fight against deforestation and advancing sustainable forestry practices. These are just two examples of the multitude of actions accelerating momentum around the world to safeguard our climate.

I have tremendous gratitude for the work that so many people across the globe have done to bring us to this point. I also have great gratitude for work that is happening now as government officials and elected representatives are rolling up their sleeves to do what must be done. But most of all, I have gratitude for all of the challenging and rewarding work ahead.

We have to make these changes. And so we are making these changes, one bold, leaping step at a time.

—Christiana Figueres, Global Ambassador for the Under2 Coalition and former Executive Secretary of the United Nations Framework Convention on Climate Change

**Toward Carbon-Free States, Provinces, and Regions: Relative Impact**

Holding warming to 1.5°C is crucial for our survival. Passing that threshold means more weather extremes, major crop losses, and low-lying areas and even entire countries being submerged under the ocean. To keep within the goal of a 1.5°C temperature rise, we must take strong and ambitious on-the-ground action. Subnational governments are crucial to that effort.

Countries around the world have set ambitious climate goals, yet national governments don’t have full control and are often further removed from ground-level action. Thus, there is critical need for action from state, provincial, and regional governments. Subnational governments are responsible for delivery of basic services and policies that are essential to development, and they have authority over approximately 9% of their countries’ entire GDP; for countries organized as federations, the share is even higher, at 18% of GDP.

Approximately 77% of the world’s countries have subnational regional governments, and countries that have regional governments are responsible for over 90% of all greenhouse gas emissions, so action at this scale can affect the majority of the world.

Estimates for the number of cities in the world vary a lot, ranging from tens of thousands to millions, depending on the definition of a city and method of estimation. A few sources indicate the existence of over 4,000 cities with more than 100,000 people, while obviously a great many smaller cities fill in the rest of the urban profile. In contrast, the number of regional governments is closer to 2,000 and covers a multitude of cities at once. Therefore, significant action at this scale becomes crucial for driving impact.
About This Handbook

The Carbon-Free Regions Handbook helps state, provincial, and regional governments implement policies and actions that place their communities on an aggressive path toward sustainable, low-carbon economies. It is a companion to The Carbon-Free City Handbook, which Rocky Mountain Institute launched in November 2017 at COP23 in Bonn, Germany.

Local governments all over the world are already taking ambitious action to reduce carbon while strengthening their ability to thrive in the 21st century. That work is the bounty that feeds this handbook. Other governments can learn from their peers, adapt these best practices, and progress faster.

State, provincial, and regional government action is essential to unlock what cities can do. And their action can help create collective impact across community jurisdictions, bridging boundaries that might otherwise impede those efforts. Regional governments are also essential to reaching rural communities. Cities and rural communities rely on one another for different needs, and uniting for climate action can substantially scale their collective impact. Although regional action is important on its own, it can have a considerable effect in moving the municipalities and businesses within a region's borders.

Complementing the City Handbook

The Carbon-Free City Handbook is helping cities around the world move from climate commitments to climate action, and contains documentation from global cities that have taken action to help others accelerate. That handbook has reached a wide audience and was shared with the members of the Global Covenant of Mayors for Climate and Energy, ICLEI, and the Carbon-Neutral Cities Alliance, among others.

Cities are essential for action because they are at the forefront of climate change risk and opportunity. Nearly 600 cities are making climate commitments, with some on a path to full climate neutrality. But cities can only do so much on their own—they need support to make change on issues outside of their control.

The difference in scope and story between The Carbon-Free Regions Handbook and The Carbon-Free City Handbook are:

1. **The audience and action documents**: This handbook contains examples that are more relevant to governments of state and regional scale, whose territory spans multiple municipalities. The action documents included address this scale of governance and feature the work of regional government peers.

2. **Recommendations specific to this scale**: This book adds three new chapters on subjects not covered in the city handbook: land use, waste, and finance. Four chapters are on subjects that are covered in the city handbook: the electricity and industry chapters in this handbook contain new recommendations specific to this scale. The buildings and mobility chapters in this handbook build on the city handbook's recommendations for greater impact with solutions that cross city boundaries.

In short, the focus in this handbook is on how to apply these top recommendations at a scale that crosses municipal boundaries and integrates both urban and rural considerations. Work at this scale is critical to enabling action at the municipal scale for the multiple cities within any regional government's boundaries.
Understanding Regional Governments

Regional governments vary widely in scale and jurisdictional power, making it challenging to recommend universal actions for different governments around the world. In this handbook, we focus on governments at the subnational and larger-than-city level. Although this generally signifies states and provinces, it could also mean counties and multistate structures or collaborations. Spain, for example, has autonomous regions that include multiple states. We invite and encourage all local governments to make use of these recommendations where they have the power to do so.

For this handbook, “regions” is used as a general term for any subnational government whose jurisdiction covers multiple municipalities.

Opportunities for Regional Collaboration

Regional governments are in a unique position to coordinate regional efforts and enable their constituents to achieve more than they would on their own. Because other local governments are included within their borders, regional governments are in a particularly strong position to drive efforts that cross geographic and political boundaries.

This collaborative approach provides a variety of benefits. It prevents the situation of municipalities simply relocating problems to nearby jurisdictions. Unified solutions create a less confusing landscape for businesses, which otherwise have to navigate changing requirements in each locale. Regional solutions also create economies of scale to lower costs. Examples of this kind of collaboration include:

- **Bulk procurement programs**
- **Regional mobility planning**
- **Regional energy offices for cities**, such as the Agence Régionale d’Évaluation environnement et Climat en Nouvelle-Aquitaine and the Southeast Michigan Regional Energy Office

Collaboration at any scale can prove beneficial. For example, North Rhine-Westphalia, Germany, and Minnesota, US, have partnered for years to learn and drive each other forward. This included an innovative project to pair five municipalities from each region.

Over half of the world’s countries have just three cities that makes up over one-quarter of the entire country’s carbon emissions. Regions can pursue collaborations to support city action to achieve large impact.

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1 “States” usually implies more autonomous entities in a federation. “Provinces” usually indicates subnational governments from a unitary country. “Governates” implies administrative districts that are often equated with provinces, but may themselves contain multiple provinces. “Territories” usually indicates administrative districts without the full autonomy and authority of states or provinces. “Regions” can be a formal or informal designation that indicates subnational or cross-national governments.
Stakeholder Engagement

It is important to engage stakeholders around major initiatives in a robust fashion and on an ongoing basis. Gathering guidance from relevant parties helps to ensure that governments have a full picture of the nuances and potential unintended consequences of a policy, and can inform adjustments to improve those policies. Stakeholder engagement can also create better conditions for a strong adoption and quicker execution of new programs.

Although this concept is not news to anyone working in politics or government, it is important to reiterate its importance in this context. Stakeholder engagement can be time-consuming, but it is critical to the ultimate adoption, acceptance, and success of impactful policies.

Using This Handbook

Due to the variety of forms of governments and how they function, any regional government should look for actions it can take from each section or chapter, but may have to assess which recommendations it has the power to enact. Although not all recommendations will be relevant for every region, some actions should be adopted from each chapter for almost every jurisdiction. For example, one regional government in North America may review the recommendations in this handbook and decide to pursue net-zero energy codes for new buildings. A separate regional government in Asia may have to forego this recommendation because energy codes are set only at the national level in its country, but it may have the power to enable efficient buildings through setting energy-efficiency resource standards (EERSs).

Some recommendations are based on examples that have been enacted at the city or national level. Such examples are included only where the powers exercised would typically be available for states, provinces, and regions to act upon as well.

Selection Criteria

Although there are hundreds of possible actions a regional government can take to reduce carbon emissions, four primary selection criteria helped narrow the recommendations in this guide down to 30.

The selection criteria:

- **Impactful**: leading-edge solutions that either make immediate, significant impact or enable large, long-term carbon reductions
- **Immediately Actionable**: could be launched by state/regional staff within one year
- **Achievable**: recently proven and economically viable, with compelling examples of successful implementation
- **Broadly Relevant**: applicable for most states, provinces, and regions globally

Criteria for Selecting Recommendations
Recommendation Format

The handbook’s recommendations are organized into seven core chapters. For each recommendation, you’ll find:

**Overview**
Brief description of the recommendation

**Action Documents**
Specific policies, requests for proposals (RFPs), guides, ordinances, action plans, toolkits, and other examples from other states and regions ripe for inspiration and emulation

For more information on all action documents, please visit rmi.org/carbonfreeregions.

**Key Considerations**
Must-know perspectives on a given recommendation, including:

- **Pitfalls:** potential challenges, caution flags, common mistakes
- **Best Practices:** how to do it well
- **Next Wave:** “extra credit” for states and regions contemplating progressive implementations of a given recommendation

**Global Spotlights**
Regional governments around the world that are leading by example for a given recommendation

**Resources**
These additional resources provide useful guidance, examples, and general information to help staff and policymakers plan their own action for each recommendation

For more information on all recommended resources, please visit rmi.org/carbonfreeregions.

Benefits

**Carbon and Greenhouse Gas Emissions:** all recommendations are included for their large potential positive climate impact, whether direct, indirect, ancillary, scope I-II-III, etc.

**Economy:** could include energy cost savings, avoided operations and maintenance costs, increased revenues through taxes or fees, job creation, real estate property value increases, business attraction, employee productivity gains, and other economic benefits

**Health and Environment:** could include improved air quality, greater opportunities for physical activity, and other health and environmental benefits

**Safety and Resilience:** could include improved disaster preparedness, fewer pedestrian and traffic accidents, removal of combustion hazards, emergency backup power sources, and other public safety and community resilience benefits

**Aesthetics and Quality of Life:** could include area beautification and greenscapes, less congested roads, improved comfort, reduced noise pollution, and other benefits that strengthen the region’s pride and bolster resident happiness

**Community Service and Equity:** could include broader access to regional services (especially for low-income residents), expanded options that empower residents with choices, and other benefits that serve the general public en masse
# Handbook Recommendations at a Glance

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24. Organic Waste Diversion  
25. Open Burn Ban  
26. Waste Energy Capture  
27. Capital Availability  
28. First-Cost Solutions  
29. Market Incentives  
30. Reduced Procurement Costs
Map of Recommendation Examples

This map shows the locations of the examples referenced throughout this handbook, color-coordinated with the icons on the previous page.
buildings
Buildings are our environment—a majority of humans spend most of their time in buildings at home, at work, and during their leisure time. As a result, buildings are places that people can relate to, and they provide multiple benefits when improved, including greater comfort, positive health effects, and lower ongoing costs. Buildings also account for almost one-third of global emissions, so they’re a critical sector to address. Regional governments have an essential role in setting standards and goals to improve this sector.
Net-Zero Codes
Phase in net-zero carbon or energy requirements for new construction

Establish a plan for regional building codes to either immediately require net-zero carbon or net-zero energy performance for new buildings, or to phase in a net-zero standard. Focus the policy on deep energy efficiency, including requirements for on-site solar where feasible and access to local renewable energy options.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- California’s ambitious net-zero codes in the Integrated Energy Policy report and the revised 2019 Standards for Low-Rise Residential Buildings (pp. 296, 304–305)

- Lombardy Region, Italy, buildings ordinance (in Italian)
Key Considerations

⚠️ Many builders/developers believe new net-zero energy buildings have a substantial up-front cost premium—this belief can be mitigated through training, finance options, incentives, and education

🌟 Build political support among key players in the real estate and construction industries

🌟 Develop regional job market training for advanced construction practices

🌟 Phase implementation to reduce strain on low-income communities and small businesses in the first few years

🌟 Integrate with any policies related to on-site energy generation

🌟 Pair with financing and incentive structures that offset higher up-front costs with long-term energy savings

🌟 Leverage community solar options that are viable to displace on-site generation

Global Spotlights

**Washington State (USA)** | Developed a pathway for all new buildings to be energy-neutral by 2030 through improved energy codes by requiring advanced building envelopes, appliances, controls, renewable energy technologies, and other methods

**Lombardy (ITA)** | Requires new buildings and buildings undergoing major renovations to be net-zero energy years ahead of the requirement across the EU (by 2016, as opposed to the EU’s 2020 target); ties building energy certificates to a building’s deed when the building or an individual housing unit is sold

Recommended Resources

Find resources at [rmi.org/carbonfreeregions]


- Online Compliance System for Energy Conservation Building Code (ECBC) for Hyderabad

- *Rhode Island Residential Stretch Code*, a phased-in step toward net-zero codes

- *Washington State Energy Code: Progress Toward 2030*


- California Public Utilities Commission website about net-zero energy requirements

“ECBC [energy conservation building code] 2017 is a leap forward toward strengthening India’s capabilities to combat climate change in a sustainable manner. I have recommended that all new buildings and offices in the future be Super ECBC and net-zero energy buildings.”

—Piyush Goyal, Former Power Minister, India

Source: *The Economic Times, India*
Existing Building Upgrades
Adopt minimum efficiency standards to upgrade existing buildings

Require existing buildings to meet certain standards for energy efficiency in the form of building-equipment efficiency standards, targets for energy consumption metrics (like energy consumption per unit area), or other methods. These standards should set requirements that are specific to a given building use type.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Lombardy Region, Italy, ordinance DGR X/3904 (adopted on 24 July 2015) (in Italian)
- Queensland MP 4.1 Sustainable Building Code
- California building energy-efficiency standards for residential and nonresidential buildings (2016)
Key Considerations

⚠️ Could increase inequity if low- and moderate-income communities are required to meet standards without targeted financing or implementation assistance

⚠️ Resistance from real estate and construction industries could slow adoption

⭐ Reduce the burden on small building owners through tiered phasing, focusing first on larger buildings with a greater ability to implement

⭐ Develop financing mechanisms to help small building owners and homeowners reduce any up-front cost burdens, including provisions for assistance to low-income housing

⭐ Work with city leadership, the real estate market, the construction market, and commercial and residential owners/tenants to understand risks, reduce market disruption, and build support

⭐ Consider tying energy upgrade requirements to triggers, such as a planned renovation or a building sale

⚠️ Standards become more stringent over time, moving toward net-zero energy ready

Global Spotlights

Lombardy (ITA) | Requires new buildings and buildings undergoing extensive renovation to comply with Nearly Zero-Energy Building standards; ties building energy certificates to a building’s deed when the building or an individual housing unit is sold

Queensland (AUS) | Major renovations to existing houses and townhouses must achieve a minimum six-star energy equivalence rating; major renovations to multiunit residential buildings must achieve an average five-star energy equivalence rating

California (USA) | California is doubling energy efficiency in existing buildings by 2030 through several efforts, with targeted prescriptive standards for lighting, electronics, and other common products, by expanding its energy benchmarking requirements and by standardizing reporting and analysis tools

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Building Codes Assistance Project
- Information about California’s various requirements for new and existing buildings
- Policies for Better Buildings, Rocky Mountain Institute, August 2018

“The best way to reduce emissions is to consume less energy—this is a challenge in existing buildings. Lombardy Region is at the forefront of promoting energy efficiency, starting from the renovation of public buildings all the way up to the whole building heritage.”
—Raffaele Cattaneo, Minister for Environment and Climate, Lombardy Region, Italy
Robust Regional Efficiency
Set region-wide energy-efficiency standards that spur deep improvements

Require electric and/or fossil fuel utilities and administrators involved in the energy supply chain to develop energy-savings programs for their customers. These energy efficiency resource standards (EERSs) can be put into effect through legislation or regulation and should be coordinated with a renewable portfolio standard (RPS) (see recommendation #10 Renewable Portfolio Standard).

Action Documents
Find action documents at rmi.org/carbonfreeregions

- **State of Minnesota Executive Order 11-12**, Providing for Job Creation through Energy Efficiency and Renewable Energy Programs for Minnesota’s Public Buildings

- **Flanders’s decree** establishing general provisions on regional energy policy *(in French)*

- **New South Wales Energy Saving Scheme Rule of 2009**
Key Considerations

- Create an energy-efficiency certificate market (e.g., a white certificate market) to buy and sell energy credits
- Coordinate closely with an RPS
- Base targets on cost-effective energy-efficiency potential
- Implement energy-efficiency business model reforms such as performance incentives for the program administrator
- Develop a power purchase agreement (PPA) for energy savings
- EERS and RPS that add up to 100% carbon reduction

Global Spotlights

Flanders (BEL) | Requires minimum energy performance, internal climate standards, and a minimum share of energy from renewables for all new buildings and for conversions that require an urban development license application

Minnesota (USA) | Adopted building standards designed to achieve energy consumption reductions of 60% in 2010, increasing 10% every five years toward an ultimate target of 100% by 2030; requires a 20% reduction in energy use in state facilities and requires the use of the B3 Benchmarking website to track the success of these efforts

New South Wales (AUS) | Places an obligation on energy retailers and other liable parties to purchase energy savings in the form of annual certificates generated through a series of efficiency programs; has supported projects that will save more than 21,000 GWh of energy and AUS$3 billion over their lifetimes

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- Database for State Incentives for Renewables & Efficiency (USA)
- American Council for an Energy-Efficient Economy State and Local Policy Database
- Minnesota B3 Sustainable Building 2030 Energy Standards
- New South Wales Energy Savings Scheme

435 Indio Way | © Bruce Damonte Photography
Mobility and transportation are essential components of a community. They define how we access jobs, education, services, and social events. Transportation currently produces 14% of global greenhouse gas emissions. We can decrease the carbon intensity of transportation while increasing mobility choices and health benefits. For regional governments, the focus should be on enabling cities to invest in better mobility options, and building the interconnections that integrate these services across municipal boundaries.
Electric Vehicle Charging
Deploy region-wide infrastructure for charging electric vehicles

Increase and improve region-wide infrastructure for electric vehicles through funding, codes to support infrastructure build-out, public-private partnerships to facilitate third-party ownership of infrastructure, extra capacity to facilitate further growth, and public engagement for feedback on charger deployment.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Guangdong Province planning documents (in Chinese)
- Gifu Vision for 2050 (in Japanese)
**Recommended Resources**

Find resources at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- *Removing Barriers to Electric Vehicle Adoption by Increasing Access to Charging Infrastructure*, Seattle Office of Sustainability and Environment, 2014
- *Comparison of Leading Electric Vehicle Policy and Deployment in Europe*, 2016
- *Advancing Electric Mobility Through Public-Private Partnerships: The Oregon Case Study*, 2017

**Global Spotlights**

**Gifu Prefecture (JPN)** | Provides funding to cover up to one-third of the cost of installing a charging station; the *michinoeki* (roadside stations) throughout the prefecture all include prominent and accessible EV charging areas; and Gifu has reached the goal of 500 charging stations by 2050, almost 33 years ahead of time

**Ontario (CAN)** | Working with public- and private-sector partners to create a network of electric vehicle stations in cities, along highways, and at workplaces and public spaces

**Guangdong (CHN)** | Has already installed over 2,500 charging stations with plans to have 10,000 charging stations across the province by 2020, including intercity quick-charging stations along the highways

**Catalonia (ESP)** | Launched an initiative to create fast charging infrastructure and run pilot projects between 2016 and 2019 through its state-associated energy institute

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**Key Considerations**

⚠️ Reduction in petroleum consumption can decrease state transportation revenues, but can be made up through road use taxes that create disincentives for low load-factor vehicles

⚠️ Lack of uniform region-wide operating standards for charging stations hampers deployment

🌟 Remove barriers to the retail sale of electricity as a transportation fuel and promote competitive plug-in electric vehicle charging rates

🌟 Develop operating and permitting standards for charging station uniformity across the state/region

🌟 Develop public-private partnerships with charging network providers and other private companies to manage and maintain locations

🌟 Implement electric vehicle (EV) charging infrastructure requirements in zoning and permitting of new public parking garages and parking lots

🌟 Provide incentives, programs, and technical assistance to developers, property managers, and companies that install EV charging infrastructure

🌟 Smart chargers can provide network management, load balancing, peak demand reduction, and vehicle-to-grid integration

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“The Catalan Institute for Energy has launched different initiatives to transform Catalonia into an EV-friendly jurisdiction. One of these is the creation of the Catalan Fast Recharge Infrastructures Network, which will be completed by the end of 2019, and include a network of recharging stations within a 30 km radius.”

—Damià Calvet, Ministry for Territory and Sustainability, Catalonia, Spain
Fleet Electrification
Electrify government fleets, embolden private fleets

Facilitate the adoption of electric vehicles by commercial and government fleet operators through fleet emissions reduction requirements, targeted public policies, tax credits, and increased charging infrastructure. Promote electrification of taxi, carsharing, and police fleets.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- City of Seattle Executive Order 2018-02: Green Fleet, an executive order directing city departments to accelerate a transition to a clean and green city fleet

- Propelling Quebec Forward With Electricity: Transportation Electrification Action Plan 2015–2020

- Qfleet Electric Vehicle Transition Strategy: For the Queensland Government motor vehicle fleet
Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Plugged-In Fleets: A guide to deploying electric vehicles in fleets, The Climate Group
- A roadmap for electrifying your fleet
- Washington State Electric Fleets Initiative
- Switched on Scotland Phase 2: An Action Plan for Growth

Global Spotlights

Scotland (GBR) | Offers interest-free loans for businesses to purchase new electric vehicles, delivers procurement advice and support, and provides financial support toward the cost of installing charge points for fleet vehicles. A second phase includes direct funding for local authorities and other organizations to switch to electric vehicles

Queensland (AUS) | Replacing existing vehicles in the government fleet with plug-in hybrid electric vehicle models, introducing EVs into carsharing pools, introducing battery electric vehicles to match existing lease vehicle replacements, and incentivizing agencies to take up electric vehicles

Shenzhen (CHN) | Converted all 16,000 of its buses to electric through a subsidy covering half the cost of a new bus, and added thousands of charging stations for buses that can also be used by private drivers

Quebec (CAN) | Promoting pilot projects to electrify taxi fleets, providing rebates for businesses to electrify their fleets, adding 1,000 EVs to the government fleet by 2020, and installing charging stations at government buildings

Maharashtra (IND) | Maharashtra state is a top contributor to the Indian national government’s E-Mobility mission—the state has signed a memorandum of understanding with a state-run energy service company to lease EVs and install charging infrastructure at all government offices in Maharashtra

“Our Switched on Fleets initiative has delivered over 500 ULEVs [ultra low-emission vehicles] into the Scottish public sector.”

—Humza Yousaf, Minister for Transport and the Islands, Scotland, UK

Key Considerations

⚠ Prepare to meet increased power requirements when multiple chargers are installed for fleet charging

🌟 Equip all new fleet vehicles with telematics hardware to gather data

🌟 Offer online resources and in-person trainings to fleet managers and procurement departments that articulate the favorable economics

🌟 Offer nonfiscal incentives such as high-occupancy vehicle (HOV) lane exemptions

🌟 Offer incentives for placing electric vehicles in rental and car-sharing fleets

🌟 Establish electric vehicle requirements for government fleets

🌟 Assess feasibility and opportunities for pooled purchases with other government and private fleets to secure greater price discounts, stronger contract terms and conditions, and improved maintenance and service agreements
Clean Vehicle Manufacturing
Set manufacturing efficiency requirements for vehicles

Set manufacturing efficiency requirements for vehicles, including zero-emission vehicle (ZEV) standards, a low-carbon fuel standard, and air-quality standards.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- British Columbia Renewable and Low-Carbon Fuel Requirements Regulation, 2017
- California’s Zero-Emissions Vehicles Regulations
Key Considerations

⚠ Up-front costs of zero-emission vehicles remain higher than equivalent conventional models

🌟 Require a percentage of vehicles purchased by state/regional agencies to be zero-emission vehicles

🌟 Establish a retirement and replacement program to make it easier for people to replace older, high-polluting vehicles with cleaner vehicles

🌟 Start with modest ZEV requirements that increase over time as consumers become more familiar with the growing range of continually improving ZEV products

🌟 Ensure development of interoperability standards for electric vehicle charging stations

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- **California Advanced Clean Cars Program**
- “What is a clean fuel standard? Lessons from B.C.,” Clean Energy Canada

Global Spotlights

**British Columbia (CAN)** | Requires minimum renewable fuel content (5% for gasoline and 4% for diesel) and requires a reduction in carbon intensity of fuels of 15% by 2030 from a 2010 baseline for all transportation, except for fuel used by aircraft or for military operations; requires refiners to supply the province with gasoline and diesel that emits less carbon pollution, or provide fuels that pollute less, including the pollution that comes from extracting, transporting, and processing. The standard becomes stronger over time with a goal to avoid 3.4 million tons of carbon pollution

**Uttar Pradesh (IND)** | Created the draft *Uttar Pradesh Electric Vehicles Manufacturing Policy 2018*, a roadmap to promote additional EV manufacturing in the state through special incentives and concessions that are expected to attract investments in EV manufacturing capacity, EV battery manufacturing and assembling capacity, and the development of battery charging and swapping infrastructure for EVs in the state in line with the state’s Industrial Investment and Employment Promotion Policy

**California (USA)** | Combines pollutants and greenhouse gas emissions into a single coordinated package of standards, including efforts to support and accelerate the numbers of plug-in hybrid electric vehicles and zero-emission vehicles in the state; has the long-term goal of 1.5 million ZEVs in California by 2025. Includes requirement for manufacturers to sell specific numbers of clean car technologies, including battery electric vehicles, fuel cell vehicles, and plug-in hybrid electric vehicles

**Multi-State ZEV Action Plan (USA)** | Nine US states (CA, CT, MD, MA, NY, RI, VT, ME, NJ) require increased sales of zero-emission vehicles under the auspices of the California low-emission vehicle program, with requirements increasing over time. By 2025, about 15% of new vehicles sold in the participating states will be required to be ZEVs
Clean Freight Delivery
Transition to cleaner freight vehicles and improve delivery logistics

Improve freight efficiency through setting efficiency standards, building efficient links between urban, regional, and national logistics networks, and adopting market-based congestion mitigation policies. Address logistics sprawl through planning and zoning decisions and use fiscal and nonfiscal incentives to accelerate the adoption of electric trucks.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Catalonia’s Law 16/2017 establishing a carbon tax on heavily polluting freight and shipping vehicles (in Spanish)
- Go to 2040: Comprehensive Regional Plan, Chicago Metropolitan Agency for Planning, 2010, Chapter 12, “Create a More Efficient Freight Network”
Key Considerations

🌟 Optimize freight logistics, including by commodity and/or vehicle type, based on real-world data about truck movement

🌟 Ensure that distribution centers serving high-value sectors like e-commerce and parcel delivery can stay in the urban core

🌟 Promote logistics density and intermodal connectivity in metropolitan areas through integrated regional planning and zoning

🌟 Implement mandates or incentives for electric trucks

🌟 Promote truck platooning, a method in which trucks closely follow each other to reduce fuel consumption

🌟 Create dedicated “e-highways” with overhead electric infrastructure for trucks

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- *Improving Efficiency in Chinese Trucking and Logistics*, Rocky Mountain Institute, August 2016


- *Where It Makes Sense for Fleets to Go Electric*, NACFE, 2018

- José Holguín-Veras, Cara Wang, Michael Browne, Stacey Darville Hodge, Jeffrey Wojtowicz, “*The New York City Off-hour Delivery Project: Lessons for City Logistics,*” Procedia - Social and Behavioral Sciences 125, March 2014


Global Spotlights

Shenzhen (CHN) | Discontinued issuance of registration for diesel trucks as of June 2017 and subsidizes electric trucks and chargers. Electric trucks pay no tolls and parking fees, can use bus lanes, and have unlimited access to the urban center (while diesel trucks are subject to strict limitations on hours of entry and permissible routes)

Catalonia (ESP) | Places a tax on heavily polluting ships and vehicles

New York, New York (USA) | Incentivizes receivers to accept night delivery from carriers to relieve daytime congestion, and provides goods’ security with minimal or no need for off-hours staffing

“The traditional logistics operational models cannot continue. In accord with the demands of an ecological society, we must adopt the concepts of modern logistics management; ceaselessly improve IT use, standardization, and automation ... and develop green logistics to save energy and reduce emissions.”

—Development Research Center of the State Council, China

Source: *Improving Efficiency in Chinese Trucking and Logistics*, Rocky Mountain Institute
Public Transit
Enhance public transit through improved infrastructure and smart logistics

Support public transit infrastructure through investing in new bus transit routes, donating land (or selling land at reduced prices) for stations and terminals, promoting transportation demand management and transit-oriented development, and implementing real-time information.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- *Quebec Sustainable Mobility Policy*, 2030 *(in French)*
- *Quebec Sustainable Mobility Policy Action Plan*, 2018–2023 *(in French)*

“If you imagine without this sophisticated system, we would have been a very car-oriented city. We would have been like a traffic hell.”

—Chang Yi, a transportation specialist at the Seoul Institute, South Korea

Source: CNNMoney, Seoul
Sustainable mobility means easier, more economical, and faster travel, integrated into the very fabric of our communities. Considering the challenges of climate change and an aging population, as well as Québec’s ambitious social and economic aspirations, this is a necessary societal choice for our future.”

—André Fortin, Ministre des Transports, de la Mobilité durable et de l’Électrification des transports (Minister of Transport, Sustainable Mobility, and Transport Electrification), Quebec, Canada
Mobility Alternatives
Support regional nonmotorized infrastructure

Promote nonmotorized travel through funding for bicycle and pedestrian projects and programs, policies to support multimodal transportation, and laws that ensure the safety of nonmotorized travelers.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Cycle Policy 2002–2012 City of Copenhagen
Key Considerations

⚠️ Reallocating road space to nonmotorized transport options without proper supporting incentives to increase use of these alternatives can lead to unwanted increases in congestion on roads.

🌟 Map existing infrastructure, including facilities under local jurisdiction, to identify gaps in the walking and bicycling network.

🌟 Require appropriate multimodal accommodation on all state-owned or state-funded roadways.

🌟 Integrate nonmotorized planning into all transport and land-use planning activities.

🌟 Adopt a complete streets policy by directing transportation planners and engineers to routinely design and operate the entire right-of-way to enable safe access for all users, regardless of age, ability, or mode of transportation.

🌟 Provide grants to enable experimentation of new business models and programs that encourage nonmotorized travel.

Global Spotlights

Denmark (DNK) | Invested over $160 million in bicycle infrastructure, including bike- and pedestrian-only bridges, 7,000 km of separate dedicated bicycle lanes, and a network of cycle superhighways to get people from the suburbs to the city center. There are now more bicycles than cars on the streets.

Washington State (USA) | Incorporates walking and cycling design requirements into all transportation infrastructure projects and other appropriate projects.

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- Cycling Plans, Strategies, and Design Guidelines, GIZ Transport and Mobility, 2016
- Non-motorized Transportation Planning, Victoria Transport Policy Institute
- Promoting Non-Motorized Transport in Asian Cities: Policymakers’ Toolbox, Clean Air Asia Center, 2013
- Non-Motorised Transport—Best Practice Manual, Department of Environmental Affairs, South Africa, 2014
- The Innovative DOT: A handbook of policy and practice, Smart Growth America and State Smart Transportation Initiative, 2012
- The Best Complete Street Initiatives of 2017, Smart Growth America, 2017
- Accommodating Bicycle and Pedestrian Travel: A Recommended Approach, US Department of Transportation
- Model Legislation, The League of American Bicyclists
The future is electric. Buildings, vehicles, industrial processes, and consumer products are increasingly turning to electricity for power. But for electricity to service all of these needs, we must make sure that our sources for electricity come from renewable or zero-emission energy. Because utilities, electric grids, and rate design usually happen at a regional scale, this is a critical area to drive change.
Renewable Portfolio Standard
Set or increase a renewable portfolio standard (RPS)

Require electric utilities to secure a minimum percentage of their electricity from renewable generation sources, focusing on ambitious “reach” targets or even 100% renewable energy. This should be paired with an energy efficiency resource standard (See recommendation #3 Robust Regional Efficiency).

Action Documents
Find action documents at rmi.org/carbonfreeregions

- HB623. Hawaii state legislation enacting 100% RPS
- Australian Capital Territory Next Generation Renewables Auction Request for Proposals

“With 100% renewable electricity in 2020 locked in, we will reduce emissions by 40%. Our next challenge is net-zero emissions by 2045.”

—Shane Rattenbury, Minister for Climate Change, Justice, Corrections, Consumer Affairs, Mental Health, and Road Safety, Government of Australian Capital Territory, Australia
Key Considerations

⚠️ Determine whether customer-sited, behind-the-meter renewables count toward utility renewable energy target compliance

⚠️ Determine whether a utility and its subsidiaries/affiliates can pool their generation portfolios to meet the standard, or if each must meet the standard individually

🌟 Set intermediate targets and track progress toward them

🌟 Specify if energy efficiency, renewable energy certificates/certificates of origin, and distant generation (versus local) count toward meeting requirements

🌟 Empower the state public utilities commission (or similar regulatory or other oversight agency) to enforce compliance and penalize the lack thereof

🚀 Go beyond electricity—consider economy-wide renewable energy targets, inclusive of electricity transportation, heating, etc.

🚀 Include a renewable storage target to complement high-percentage renewable energy targets

Global Spotlights

Australia Capital Region (AUS) | Set a 90% renewable energy target by 2020, developed a legislated feed-in tariff mechanism and reverse auction process that provides a high degree of investment certainty for project developers and financiers. Already, 340 MW of projects have been awarded feed-in tariffs, including Australia’s largest (20 MW) solar photovoltaic farm, completed in September 2014

Hawaii (USA) | Requires utilities to go all renewable by 2045, with interim, incrementally increasing targets for 2020, 2030, and 2040

Fukushima Prefecture (JPN) | Set a target of 100% renewable energy by 2040, decommissioning nuclear power generation and building a renewables portfolio that includes solar, small hydro, offshore wind, and a small amount of biomass

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- Renewables Ready: States Leading the Charge, Climate Council, 2017
- State Renewable Portfolio Standards and Goals, National Conference of State Legislatures
- US Renewables Portfolio Standards: 2017 Annual Status Report, Lawrence Berkeley National Laboratory, 2017 (USA)
- Canberra 100% Renewable, Australian Capital Territory Government
Coal Plant Replacement
Retire existing coal plants and reject plans for new coal plants

Phase out coal-fired electricity generation through a combination of accelerated retirement for existing plants, emissions caps, a carbon tax, or other regulatory standards, and policies that prohibit financing of, and/or place an outright moratorium on, new coal-fired power plant construction. Provide viable alternatives in regions where coal-fired generation is expanding due to population and demand growth and rural electrification.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- **Executive Order No. 9** Declaring the Province of Negros Oriental as an Environment-Friendly and Clean Energy Province, 2017


- “**Ending Coal for Cleaner Air Act**,” Legislative Assembly of Ontario, 2015

- “**SB 1547: Clean Electricity and Coal Transition Plan**,” State of Oregon, 2016
Key Considerations

⚠️ Emissions restrictions, a carbon tax, and/or cap-and-trade programs offer complementary tactics but, on their own, may not be as effective as accelerated, mandated retirements

⚠️ Consider “transition payments” to generators to offset stranded capital for accelerated retirements

🌟 Make sure to include post-coal energy planning to backfill generation capacity

🌟 Be explicit as to whether carbon capture and storage technologies are allowable

🌟 Don’t overlook the role of denying finance/lending to coal-fired generation projects

🌟 Support for affected communities and individuals can be crucial, including retraining, hiring, and providing bridge financial assistance to legacy coal workforce

🌟 Eliminate the use of fossil fuels in favor of clean energy portfolios of renewables, storage, efficiency, and flexible demand

Global Spotlights

Negros Oriental (PHL) | Declared itself “an environmentally friendly and clean energy province” and declared that government offices and local agencies “shall not issue any permit, authorization, endorsement, or any expression of support to the development of coal-fired power plants.”

Ontario (CAN) | Became the first province or state in North America to permanently ban coal-fired generation via legislative action

Alberta (CAN) | Entirely phasing out coal by 2030 through policy mandates, financial support, and employment retraining for affected communities; transition payments to generators, a carbon tax, and renewable portfolio standard, and natural gas fuel switching

Oregon (USA) | Became the first US state to vote to go coal-free (by 2035) via bipartisan legislation, and has since been joined by neighboring Washington State

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- The Economics of Clean Energy Portfolios, Rocky Mountain Institute, 2018
- “Phasing Out Coal Pollution,” Government of Alberta, Canada
- “The End of Coal,” Province of Ontario, Canada

“For me, there would be massive destruction to the environment if we develop or establish a power plant using coal because of its massive carbon dioxide emissions. We will push for renewable and clean energy, like, for example, solar energy, windmills, hydro power plants, and geothermal plants. These are what we should continue because they are not destructive.”

—Roel Degamo, Governor of Negros Oriental, The Philippines

Source: The Visayan Daily Star
Responsive Rate Design
Support rate designs that encourage energy efficiency, renewable energy, and distributed energy resources (DERs)

Require utilities to evolve from legacy “block” rates to technology-agnostic, modernized rate designs—such as granular time-of-use pricing and real-time dynamic pricing—that better reflect the reality of today’s and tomorrow’s grid, and that appropriately value the costs and benefits of DERs, energy efficiency, and flexible demand.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- “SB 2939: Ratepayer Protection Act,” State of Hawaii
- “Directive on Common Rules for the Internal Market in Electricity,” European Commission
Key Considerations

⚠️ Consider how rate structure changes might affect low- and moderate-income households

⚠️ Plan for how to simplify and/or automate the experience for customers despite a likely shift to more granular, more complex overall rate structures

🌟 Develop a transition plan to new rates, including whether customers are default opt-in or opt-out; opt-out options create far greater participation

🌟 Evaluate grid modernization, smart grid, and digitalization needs (e.g., smart meter deployment) as a key enabler for modernized rate structures

 kursi Align rates to desirable outcomes for grid operation, not to specific technologies (e.g., solar-only net-metering tariff, electric vehicle household rate)

 kursi “Change the rules of the game” for utilities from cost-of-service ratemaking to performance-based ratemaking to realign utility incentives and business model

 kursi Add an emissions signal (e.g., real-time marginal grid emissions) alongside traditional economic market signals embedded in modernized rate structures

Global Spotlights

California (USA) | The state’s investor-owned utilities must switch to default time-of-use electricity rates starting in 2019

European Commission (EU) | Requires utilities to offer a dynamic pricing option to all customers

South Korea (KOR) | The electric utility—majority owned by the government—has advanced electricity pricing that varies by season, alignment of peak, total consumption, peak demand, and other variables

Recommended Resources

Find resources at [rmi.org/carbonfreeregions]

- [Rate Design Options for Distributed Energy Resources](#), American Public Power Association
- [Rate Design for the Distribution Edge: Electricity Pricing for a Distributed Resource Future](#), Rocky Mountain Institute
- [State Performance-Based Regulation Using Multiyear Rate Plans for US Electric Utilities](#), Grid Modernization Laboratory Consortium, US Department of Energy
- [Distributed Energy Resources Rate Design and Compensation](#), National Association of Regulatory Utility Commissioners
- “Knowledge Center: Pricing and Rate Design,” Regulatory Assistance Project
Responsive Grid Planning
Support grid planning that puts distributed energy resources on an equal footing with other generation sources

Make distributed energy resources (DERs)—including customer-sited renewables, behind-the-meter storage, energy efficiency, and flexible demand—a central part of an integrated, modernized grid and resource planning process. Revise legacy processes that make sweeping assumptions about demand growth and meet that demand exclusively through centralized bulk generation.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- “Order on Distribution System Implementation Plan Filings,” State of New York Public Service Commission
- Chapter 39-26.6: Rhode Island’s Renewable Energy Growth Program
Key Considerations

⚠️ Broad stakeholder engagement—including utilities, customer advocates, and DER technology providers—is critically important for a successful outcome

⚠️ Define how customer- and third-party-owned DERs are credited toward utility requirements

⭐ Require that utilities regularly submit an updated integrated resource plan, grid modernization plan, distribution resources plan, or similar that includes DERs

⭐ Stipulate that plans must consider DERs via non-wires alternatives, granular value stacks, locational benefits, and other attributes as an alternative to traditional bulk power system assets

⚠️ Rebuild electricity markets to be truly DER-centric versus finding “bolt on” ways to add DERs to existing markets originally designed for top-down, centralized grid planning

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- State Engagement in Electric Distribution System Planning, Grid Modernization Laboratory Consortium, US Department of Energy

- Distributed Energy Resources Integration: Policy, Technical, and Regulatory Perspectives from New York and California, Smart Electric Power Alliance

- Planning the Distributed Energy Future, Black & Veatch and Smart Electric Power Alliance

- Study on the Effective Integration of Distributed Energy Resources for Providing Flexibility to the Electricity System: Final Report to the European Commission, Sweco

- The Integrated Grid: Realizing the Full Value of Central and Distributed Energy Resources, Electric Power Research Institute

- Beyond the Meter: Planning the Distributed Energy Future – A Case Study of Integrated DER Planning by Sacramento Municipal Utility District, Smart Electric Power Alliance

Global Spotlights

Rhode Island (USA) | Allows utility customers to sell their renewable generation output under long-term tariffs at fixed prices

New York (USA) | Rebuilding the state’s electricity markets to include DERs as active participants and to evolve utility business models and planning, including requiring distribution system implementation plans

Denmark (DNK) | Launched the Cell Control Pilot Project to leverage DERs as regional microgrids that also provided flexibility for high-percentage renewable energy integration (especially wind)

“We are moving onto more and more local production capacity for companies and households. If they have their own windmill, if they have their own solar panels, if they have other means of production, they can support the system.”

—Troels Gregersen, Nordics energy expert at PA Consulting Group, Denmark

Source: Greentech Media
Community Solar
Support community-scale solar to expand solar access

Make the benefits of distributed solar photovoltaics (PV) accessible and more affordable for customers beyond the reach of rooftop PV through community-scale solar PV projects located in or near the communities they serve. Leverage various combinations of fractional project ownership or investment, subscription to projects’ solar generation output, and virtual metering that credits a customer’s utility bill.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- The Telangana Solar Power Policy 2015
- “216B.1641 Community Solar Garden” Minnesota Statutes

“Minnesota’s success with community solar offers a valuable model for broad-based solar growth.”

—Bill Grant, Deputy Commissioner of Division of Energy Resources, Minnesota, USA
Key Considerations

⚠️ Don’t underestimate the complexity of subscription enrollment, management, and retention in shared solar business models

🌟 Pass regulations that allow virtual metering (i.e., remote metering), third-party project ownership, and/or third-party electricity sales to expand market participation opportunities and flexibility

🌟 Keep open possible ownership models, such as utility-, cooperative-, municipal-, privately, and citizen-owned mechanisms

🌟 Include requirements such as minimum percentage of a project owned by community members and maximum percentage of a project that can be subscribed by a single entity, to ensure true community participation and benefit

🌟 Include specific carve-outs for low- and moderate-income households

🌟 Make public land as well as rooftops (e.g., municipal buildings, schools) available as project host sites

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- *Beyond Sharing: How Communities Can Take Ownership of Renewable Power*, Institute for Local Self-Reliance
- “Request for Proposals: Community Solar,” RMI and six rural electric cooperatives, 2017
- How Minnesota Is Supporting Community-Based Renewables

Global Spotlights

Telangana (IND) | Provides incentives and easier development requirements for “solar parks” that can deliver solar generation, as well as a variety of support services such as training and financing

Minnesota (USA) | Provides on-bill financing for consumers subscribed to community solar programs, who get paid for all the electricity they produce even if more than they use; and there is no cap on the number of community solar projects possible. Its program has grown nearly 1,000% since January 2017 to 358 MW installed

Victoria, New South Wales (AUS) | Expanded its support for community energy projects, including solar, by identifying and removing policy and regulatory barriers, by means such as a “true value of distributed generation” study to identify and quantify the public benefit of such projects

Flanders, Belgium (BEL) | Crowdfunded community investment in large commercial rooftop installations and created a virtual net-metering paradigm that allows a household to buy a share in a PV system owned by a third-party

“The government of Telangana is committed to providing good quality, clean power to industry and the people of the state ... This state-of-the-art solar plant, which has been commissioned ahead of schedule, will help us meet our peak power requirement this season.”

—G. Jagadish Reddy, Telangana Energy Minister, India

Source: *The Economic Times*, India
Industry is the foundation of many regional economies. It is also the source of 28% of global greenhouse gas emissions, and its impact is growing faster than other sectors. Although industrial companies may be based in a single city, their work and influence usually extend across city boundaries. Regional governments provide the right scale to support industry in transitioning to low-carbon solutions.
Methane Containment
Implement methane leakage penalties and pursue methane capture

Eliminate wasted methane that is leaked into the atmosphere as a by-product of natural gas production or crude oil production, waste management, or other sources, and capture methane for productive and low-impact uses. Methane leaks should be measured, and should result in financial, regulatory, and other penalties.

Action Document
Find action documents at rmi.org/carbonfreeregions

- California Oil and Gas Regulation, which provides information about measuring and limiting methane emissions
Key Considerations

⚠️ Do not plan infrastructure upgrades that do not manage methane emissions, as they will soon be out of date and require replacement

🌟 Implement mandatory oil and gas infrastructure leak detection, reporting, and repair programs

🌟 Study old natural gas infrastructure and support upgrades to zero-emission, continuously monitored systems

🌟 Regulate natural gas supply and distribution infrastructure to reduce methane and carbon emissions across the entire value chain

🌟 When planning new natural gas infrastructure, confirm that natural gas will provide a global environmental benefit to all reasonable alternatives

🌐 Reward companies that supply and distribute natural gas with low greenhouse gas intensity

🌟 Aerial imaging can quickly identify large sources of methane leakage, which can quickly be targeted and mitigated

Global Spotlights

California (USA) | Approved a Natural Gas Leak Abatement Program to establish best practices and reporting requirements to reduce methane leaks. Established a regulation on oil and natural gas production, processing, and storage that includes restrictions on methane emissions

Colorado (USA) | Requires control devices and management practices to reduce methane emissions that typically result from actions like leaks and venting. In 2014, Colorado became the first US state to regulate methane leaks and emissions from oil and gas operations

New York State (USA) | Reducing methane leakage, addressing methane emission sources, enhancing reporting requirements, and improving regulatory consistency

British Columbia (CAN) | Requires municipal landfills generating 1,000 tons or more of annual waste to install landfill gas management systems

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Global Methane Initiative
- State methane Initiative from the National Conference of State Legislators
- California's strategy for reducing short-lived climate pollutants
- CCAC Oil & Gas Methane Partnership
Clean Industrial Processes
Electrify industrial fuel processes and disincentivize greenhouse gas-heavy industrial fuel consumption

Convert industrial processes to use fuels that minimize or eliminate greenhouse gas emissions. Where possible, electrify industrial processes and leverage renewable electricity sources.

Action Document
Find action documents at rmi.org/carbonfreeregions

- Brazilian biofuels policy, RenovaBio, and implementation documents (in Portuguese)
Key Considerations

⚠️ Not all industrial processes currently have effective electrified options

⚠️ In areas where the electric grid is not clean, electrification may increase carbon emissions

⭐ Invest in research and development for electrifying new industrial processes

⭐ Partner with industry to experiment with new low-carbon fuels or electric applications

💡 Develop policies that eliminate the use of fossil fuels for industrial process

💡 Develop programs that incentivize electrification with on-site renewables

Global Spotlights

Brazil (BRA) | Brazil is a global leader in biofuel production and sanctioned a law, known as RenovaBio, that seeks to support biofuel production, enhance market predictability, and support Brazil’s commitment to the Paris Agreement

Scotland (GBR) | The Scottish government, in coordination with industry, developed a plan that lays out several key actions to decarbonize industry. It also developed the Decarbonisation of Industry Steering Group to support industry in achieving requirements of the EU emissions trading system

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Guide to cleaner industrial processes with specific technologies and recommendations by industry
- “Electrification in the Dutch Process Industry”
Shared Industrial Flows

Develop enabling policies for sharing waste and heat flows throughout industrial districts

Implement enabling policies for allowing the sharing of waste, heat and materials, and energy, including district-level heating, cooling, and microgrid solutions, within and outside of industrial districts. This can include the support of eco-industrial parks (EIPs), circular economy districts, and/or other district formats that support the reduction of waste.

Action Document

Find action documents at rmi.org/carbonfreeregions

- UNIDO Eco-Industrial Park Implementation Handbooks (in multiple languages)

Key Considerations

⚠️ It is difficult to establish ownership and maintenance requirements of shared heating or cooling infrastructure

⚠️ Colocation of industrial and nonindustrial buildings (e.g., residences) to share waste heat can present zoning challenges

🌟 Establish energy tariffs that share the value of energy sources among producers and users

🌟 Establish trash, recycling, and water programs that value the sharing of appropriate waste streams

🌟 Establish a framework for entities that own and operate shared infrastructure and regulate shared streams of energy, waste, water, etc.
Recommended Resources
Find resources at rmi.org/carbonfreeregions

- UNIDO’s Global Assessment of Eco-Industrial Parks in Developing and Emerging Countries
- An International Framework for Eco-Industrial Parks
- Eco-Industrial Park Handbook for Asian Development Countries
- Eco-Industrial Parks from Strategic Niches to Development Mainstream: The Cases of China
- Eco-Industrial Parks Development and Integrated Management Challenges: Findings from Italy

Global Spotlights

Tianjin (CHN) | Created an early pioneering EIP, which now serves 10,000 companies

Tuscany (ITA) | Created a voluntary certification to encourage industrial ecoparks

Gujarat (IND) | Setting up two eco-industrial parks for industries to share available resources and exchange wastes and by-products with other enterprises
Clean Ports and Airports
Move to low-carbon fuels and advance infrastructure resilience in ports and airports

Set progressive goals and align regional stakeholders to provide low-carbon fuels to vessels and aircraft, develop cleaner energy infrastructure within the facilities, and catalyze the development of low-carbon fuels regionally. Support vehicles and processes for maintenance, fueling, and other activities that minimize process energy consumption and electrify loads where possible. Many ports and airports are in areas subject to extreme weather, making resilience necessary, but also creating the opportunity to serve as emergency response centers.

Action Documents
Find action documents at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- Memorandum of Understanding Template, Clean Sky 2, 2016
- Catalonia’s Law 16/2017 establishing a carbon tax on heavily polluting freight and shipping vehicles (*in Spanish*)
Key Considerations

⚠️ Lack of long-term financial commitments to purchase low-carbon fuels will hinder supplier investment in production facilities

⚠️ Airlines and shipping companies are the ultimate end customers for low-carbon fuels, so they must be included in the process of setting targets and procuring low-carbon fuels

🌟 Convene staff from a variety of ports, airports, airlines, industry trade groups, local/regional air quality regulators, fuel farms, NGOs, and alternative fuel producers when establishing carbon targets

🌈 Support policies that create market incentives for low-carbon fuels for aviation and shipping, such as renewable fuel standards and low-carbon fuel standards

鍪 Explore microgrids and other measures that increase electrical power resilience

Global Spotlights

Queensland (AUS) | Building a AU$16 million advanced biofuels pilot plant at Southern Oil Refining’s Yarwun plant at Gladstone to provide advanced biofuels suitable for military, marine, and aviation use

South Holland (NLD) | Signed a memorandum of understanding with Clean Sky 2 to help reduce CO₂, NOₓ, and noise emissions in the aviation industry and cofunded a program “to develop tools and knowledge to produce lightweight materials faster, at higher quality, and at less costs” to reduce fuel consumption at airports

Scotland (GBR) | Established the £70 million Scottish National Renewables Infrastructure Fund to support improvements in port infrastructure for the offshore wind sector

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Articles in Aviation from Advanced Biofuels USA
- Privatization and Regulation of the Seaport Industry
- Port of Seattle Commission’s Energy and Sustainability Committee
- Port of San Diego microgrid launch
Clean Industrial Vehicles
Adopt industrial vehicle-efficiency and clean-fuel requirements

Require cleaner fuels, including electrified solutions, for industrial vehicles in the state or region. This should include vehicles on industrial campuses, as well as vehicles being used in the field such as construction and farming vehicles. This recommendation is not high impact for all regions, and it is most relevant to regions with transport-heavy industries, such as open-pit mining.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Hong Kong’s Non-Road Mobile Machinery (NRMM) Resources
- London Area Non-Road Mobile Machinery (NRMM) Practical Guide
- California’s Off-Road Diesel-Fueled Fleets regulation

Key Considerations

⚠️ For industries without much on-site transport, such as underground mining, this recommendation will probably only yield minor regional impacts

🌟 Begin with a focus on large-scale operations for maximum impact without constraining small businesses

🌟 Basing this requirement on efficiency standards allows industries more flexibilities in how to meet the requirement
Global Spotlights

Hong Kong (HKG) | Implemented new regulations for controlling emissions from non-road mobile machinery; each approved or exempted vehicle must have a unique label to show that it complies with the regulation.

North Rhine-Westphalia (DEU) | Promoting a pilot project for the use of domestic vegetable oils in agricultural machinery to demonstrate the full suitability of the machinery, a significant reduction in greenhouse gases, and a contribution to domestic milk and meat production.

Baden-Württemberg (DEU) | Adopted an air quality ordinance for construction machinery for certain municipalities that phases in more stringent requirements from 2017 to 2019.

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Summary of world’s engine and vehicle emission standards, Dieselnet
- Technology Pathways for Diesel Engines Used in Non-Road Vehicles and Equipment
land use
Land use issues present both a great threat and a great opportunity to climate goals. Some 24% of global greenhouse gas emissions come from agriculture, forestry, and other land use, but this sector can also offset this impact by 20% by removing carbon from the atmosphere. Land use is best approached at the state, provincial, and regional government scale. Cities miss most of the rural impacts associated with land use. Land use matters also tend to cross subnational jurisdictions, making regional solutions necessary. These recommendations can also provide a variety of benefits for preserving and promoting biodiversity.
Sustainable Land Management
Reduce deforestation and degradation; expand the area of land under sustainable management

Promote policies that create, conserve, and expand high-carbon landscapes like natural grasslands, forests, peatlands, mangroves, and wetlands, and strengthen and enforce laws that combat deforestation.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- The Punjab Forest (Amendment) Act 2016
- Oregon 2017 ORS 526.780: Agreements for forestry carbon offsets and 2017 ORS 526.786: Rules relating to forestry carbon offsets
- National Conference of State Legislatures: State Forest Carbon Incentives and Policies
- Yucatán Peninsula Framework Agreement on Sustainability for 2030
- The Brazilian state of Mato Grosso’s “Produce, Conserve, Include” sustainable land use plan—the largest claimed effort at the subnational level (in Portuguese) Strategy document and website with documentation
Key Considerations

⚠️ Assess food security impacts of converting agricultural land to forest and/or grassland

⚠️ Reforestation is complex and often expensive—location is key for both the survival of the trees and the efficacy of the project as a carbon sink

🌟 Engage indigenous communities in land management programs and planning

🌟 Avoid deforestation through strengthening governance, providing technical assistance for forest surveying and monitoring, and developing local capacity in and public support for forest conservation

🌟 Provide financial assistance to landowners for development of management plans and for practices including reforestation and afforestation, as well as responsible thinning and disaster management

🌟 Give preferential treatment to landowners engaged in sustainable forestry management in regards to property taxes, such as tax exemptions or low, flat rates

🌟 Promote forest-products markets that drive forest expansion and enhanced management

🌟 Allow forestry projects that sequester carbon to be eligible for carbon offsets

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- **Positive Disruption: Limiting Global Temperature Rise to Well Below 2°C**, Rocky Mountain Institute
- **Governors’ Climate and Forests Task Force database**, home to 200+ laws and policies to reduce deforestation and 150+ ongoing partnerships and ongoing initiatives
- **Tropical Forest Alliance 2020 partner mapping initiative**
- **State Forest Carbon Incentives and Policies, National Conference of State Legislatures**
- “Four forestry initiatives Pakistan is taking to fight climate change,” *The Express Tribune*, 2018
- **Jurisdictional Approaches to REDD+ and Low Emissions Development: Progress and Prospects**, World Resources Institute, 2018
- **Sustainable Development Options and Land-Use Based Alternatives to Enhance Climate Change Mitigation and Adaptation Capacities in the Colombian and Peruvian Amazon While Enhancing Ecosystem Services and Local Livelihoods**

Global Spotlights

**Mato Grosso (BRA)** | Created an ambitious strategy with 21 performance targets and 40 partners, despite a complicated stakeholder setting, and secured $50 million in climate finance support to reduce deforestation

**Punjab (PAK)** | Promotes sustainable forestry investments over 134,995 acres by leasing forest land for 15 years, which can be further extended to another 15 years, to raise plantations that can fulfill the needs of the wood-based industry

**Oregon (USA)** | Authorized forest carbon offsets for afforestation, reforestation, and specific forest management practices

“The Department of Caquetá promotes the restoration of ecosystems in order to improve the capacity for resilience and increase carbon sequestration.”

—Álvaro Pacheco Álvarez, Governor, Department of Caquetá, Colombia
Open Space Conservation
Preserve and conserve forests and other open spaces to support carbon sequestration

Preserve and conserve forests, grasslands, and other open space by identifying important natural resources, using local ordinances and state laws to protect land, and acquiring critical open space that can sequester carbon.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Acre, Brazil’s State Environmental Service Incentive System Law No. 2,318 (in Portuguese)
- New Jersey’s Green Acres Program regulations and Garden State Preservation Trust Act
Key Considerations

⚠️ Expanding land conservation could potentially invoke land competition

🌟 Clarify land rights and land tenure

🌟 Develop an open space or farmland conservation plan that prioritizes lands with high-carbon stocks, such as peatlands

🌟 Create conservation easements for farmland and forests at the margins of urban areas

🌟 Employ flexible development design tools such as conservation subdivision design, clustering, and performance zoning

🌟 Establish a local open space bond or open space sales tax dedicated to land acquisition

Global Spotlights

Acre (BRA) | Has a carbon sequestration program that promotes conservation through environmental compliance, improved monitoring of small-scale deforestation and forest degradation through technological advancements, and promotion of sustainable activities in both the agriculture and forestry sectors

New Jersey (USA) | Protected over half a million acres of open space by setting aside state sales tax revenues each year for 10 years, and issuing up to $1 billion in bond proceeds to supplement the sales tax revenues over the same period

Argentina (ARG) | Every province must promote forest zoning and establish conservation areas. Some provinces provide tax and financial incentives for private owners to protect areas

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- The High Carbon Stock forestry and biodiversity approach
- State of the Atlantic Forest, World Wildlife Fund, 2017
- New Jersey Open Space Preservation
- Acre, Brazil: Subnational Leader in REDD+, Climate Focus, 2013
- San Martin, Peru, zoning study
- Tools and Techniques for Preserving Open Space, Jordan River Commission, 2010
Agricultural Methane Capture
Capture methane from livestock waste

Promote methane capture from livestock waste through financial incentives and improved biogas infrastructure, and by strengthening the market for biogas system products.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- New York Methane Reduction Plan, 2017
- California’s legislation that created the Short-Lived Climate Pollutant Reduction Strategy

“Reducing the methane emissions generated by small- and medium-sized swine farms has high benefits for sustainable development and allows us to accelerate progress toward the decarbonization of our agricultural sector.”

—Eduardo Batllori Sampedro, Minister of Urban Development and Environment, Yucatan, Mexico
Key Considerations

- Work with stakeholders to overcome barriers to pipeline injection of biomethane, grid connection for electricity, or another best-use alternative
- Classify methane gas as a renewable energy source to allow livestock owners the ability to acquire renewable energy credits
- Promote and encourage opportunities for industry innovation and the efficient use of existing infrastructure and facilities
- Strengthen markets for biogas system products such as nutrient recovery, fiber, and soil amendments
- Provide incentives to farmers to install biogas systems
- Aerial imaging can quickly identify large sources of methane leakage, which can quickly be targeted and mitigated

Global Spotlights

Yucatan (MEX) | Encourages, trains, and promotes biodigester systems on swine farms. There are currently 150 projects in 50 municipalities

New York (USA) | Reduces agricultural methane emissions through farm management practices, monitoring and reporting, and soil carbon sequestration on farms

Punjab (PAK) | Trained construction companies and local dairy farmers on the design, construction, and use of biogas plants

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Time to Act to reduce short-lived climate pollutants, Climate and Clean Air Coalition (in multiple languages)
- Climate and Clean Air Coalition’s agriculture initiative
- Case Study: Biodigestors in Small and Medium Swine Farms, Yucatan State Government
Regenerative Agriculture
Expand use of regenerative agriculture to increase carbon sequestration

Provide education, training, and incentives to enable farmers and ranchers to transition to new, more sustainable forms of agriculture and land management that help sequester carbon.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Kerala State Environment Policy, 2009
- Kerala Agricultural Development Policy
Key Considerations

⚠️ Some countries’ economies rely on agricultural products that are based heavily on conventional agricultural practices

⚠️ Soil can eventually reach a point of saturation beyond which it can no longer absorb carbon

🌟 Provide funding for research, development, and dissemination of information on sustainable agriculture practices

🌟 Set up training programs for farmers and advisors on agricultural development on improving organic matter levels in soil

🌟 Incentivize agricultural practices that increase the carbon content of biomass and soil and improve the long-term health of the soil, including the use of cover crops, compost, crop rotation, and reduced tillage

🌟 Work for the opening of carbon markets to new sectors such as agriculture and agroforestry

🌟 Promote the production of biochar and create biochar carbon offset methodologies in existing voluntary carbon market registries

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- *Regenerative Organic Agriculture and Climate Change: A Down-to-Earth Solution to Global Warming*, Rodale Institute

- 4 per 1000 initiative


- “Agriculture, Forestry and Other Land Use (AFOLU),” Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2014

- *Positive Disruption: Limiting Global Temperature Rise to Well Below 2 C°*, Rocky Mountain Institute

- Kerala State Organic Farming Policy, Strategy and Action Plan

Global Spotlights

**Kerala (IND)** | Requires all agricultural growers to grow organically by 2020 through a phased approach (converting a minimum of 10% of the cultivable land into entirely organic every year) that includes seed villages, organic farming groups, capacity building for farmers, and development of diverse channels for marketing of organic produce

**Quaréțaro (MEX)** | Provides training and efforts to create synergies among family farmers to deliver more sustainable agriculture

**Andalusia (ESP)** | Promotes dryland and irrigated herbaceous crops and olive orchards to harmonize food production with conservation and environmental protection

**Australia (AUS)** | Transitioned roughly 90% of its winter crops to conservation agriculture
Waste management is part of the basic infrastructure of a community. How waste is managed has huge implications on local health, aesthetics, and economics. Waste can create health problems, release methane into the atmosphere, and increase pollution when not managed properly. Waste management usually extends across municipal boundaries, making it an important topic for regional governments to address. The recommendations in this section can reduce greenhouse gases and create economic opportunities.
Organic Waste Diversion
Divert all organic waste from landfills

Develop policies and programs to divert organic waste from landfills, including separate collection requirements, education campaigns, financial incentives for food redistribution, and disincentives for generating food waste.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Wales Waste Measure 2010
- Municipal Sector Plan Part 1: Towards Zero Waste
  One Wales: One Planet
- Vermont Universal Recycling Law Act 148

“Wales waste strategies have been built around sustainable development, now bolstered by our ground-breaking Well-being of Future Generations Act. Wales is leading by example.”

—Lesley Griffiths, Cabinet Secretary for Energy, Planning, and Rural Affairs, Wales, UK
Key Considerations

⚠ Some initiatives may require strict monitoring to prevent illegal dumping

⚠ One of the most critical steps for these projects is training the population on waste sorting

⚠ Diverting to animal feed requires close regulation and stringent legislation on what types of food waste are used

⭐ Require separate waste-collection programs for food waste, which can then be composted, anaerobically digested, or used as animal feed

⭐ Require businesses that generate large quantities of food waste to report the origin, volume, and disposal methods of such waste

⭐ Provide tax credits and fiscal incentives for donation of surplus food

⭐ Implement “pay-as-you-throw” schemes that charge the producers of food waste for the disposal of the waste they generate based on the waste’s weight/volume

⭐ Extracting energy from compost can be added at a later stage once a compost plant is operational

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Global Food Waste Management: An Implementation Guide for Cities, World Biogas Association and C40 Cities Climate Leadership Group, 2018
- A Roadmap to Reduce US Food Waste by 20 Percent, ReFED, 2016
- ReFED US Food Waste Policy Finder
- Towards Zero Waste: One Wales, One Planet
- South Australia’s Waste Strategy 2015–2020
- Massachusetts Food Policy Council White Paper on Food Waste Reduction, 2017
- Waste Atlas with visualizations on organic percentage of waste by country

Global Spotlights

Oran (DZA) | Created waste-sorting facilities, including a composting plant. Goal is to create a model zero-waste wilaya (province)

Wales (GBR) | Food waste is collected weekly from households, and is used in five anaerobic digestion facilities, producing both energy for the national grid and a digestate used to improve the nutrient content of soil on local farms. Goal is to become a zero-waste nation by 2050

Flanders (BEL) | Mandates source-separated collection, and sets targets for per capita residential waste production, home composting, and maximum residuals; bans landfilling of unsorted waste and separated waste suitable for recovery, has a pay-as-you-throw policy, and encourages home composting

Bicol (PHL) | Created biogas digesters to create energy from diverted organic waste

Vermont (USA) | Requires that all organic waste be diverted from landfill disposal by 2020
Open Burn Ban
Ban open burning of municipal and agricultural waste

Ban open burning of municipal waste and support the ban with education and upgrading waste collection, sorting, and treatment. Ban burning of agricultural waste and support the ban with education and financing for sustainable farming techniques.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Solid Waste Law of the State of Colima, Article 25 banning open burning (*in Spanish*)
- Air Pollution Control (Open Burning) Regulation, Hong Kong
- Laws of Malaysia, Act 127, Environmental Quality Act
Key Considerations

⚠️ Highly efficient incinerators are cost-prohibitive for many low-income regions

⚠️ A ban on the use of fire for land clearing can raise the costs for small farmers to prepare their land for planting and to keep it pest-free

⭐ Conduct educational efforts that focus on the disastrous health effects of burning waste

⭐ Improve waste collection services to reduce residential waste burning

⭐ Provide financing to upgrade waste sorting and treatment facilities and convert open dumpsites to engineered landfills

⭐ Provide training and technical assistance on sustainable agricultural practices such as no-till farming to decrease slash-and-burn farming

⭐ Consider exceptions for places that require controlled burns for ecosystem restoration

Global Spotlights

Colima (MEX) | In addition to a law banning open burning, the state organized five municipalities to coordinate ending waste burning, with educational support and providing equipment for alternative disposal

Uttar Pradesh (IND) | To implement a national ban on open burning, has created educational programs for farmers and harnessed other resources to build composting infrastructure as an alternative to open burns

Hong Kong (HKG) | Prohibits open burning of construction waste, tires, and for the salvage of metal

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- A Guide to the Air Pollution Control (Open Burning) Regulation, Hong Kong
- Open Burning Project website
- Fire in the Fields: Moving Beyond the Damage of Open Agricultural Burning on Communities, Soil, and the Cryosphere, Climate & Clean Air Coalition, 2015
- UNEP Integrated Assessment of Black Carbon and Tropospheric Ozone
Waste Energy Capture
Reduce methane emissions and promote energy capture from landfills

Require the installation and proper operation of gas collection and control systems at active, inactive, and closed municipal solid waste landfills. Promote gas-to-energy recovery to produce steam or electricity.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Navajo Nation Long Range Comprehensive Solid Waste Management Plan
- Ontario guidelines on the regulatory and approval requirements for landfill gas
- Final Landfill Methane Control Measure, California Air Resources Board, 2010
Key Considerations

⚠️ Strict regulations for gas-to-energy projects could shut down some landfills that can’t afford the technology

⚠️ Landfill gas capture is never 100% efficient, meaning that some methane will escape to the atmosphere

⭐ Require a final cap on landfill sites once they are closed

⭐ Provide premium pricing for energy produced from landfill methane, including feed-in tariffs

⭐ Offer tax credits, a fast-tracked permitting process, priority access to the electrical grid, and assistance with interconnection to landfill owners producing renewable energy from landfill gas

Recommended Resources

Find resources at rmi.org/carbonfreeregions


- Financing Landfill Gas Projects in Developing Countries, Claire Markgraf and Silpa Kaza, 2016

- Climate and Clean Air Coalition, tools and resources and waste initiative

Global Spotlights

Navajo Nation (USA) | Requires operators to modernize their equipment and adopt best practices to reduce gas leaks, increase gas capture, and reduce venting and flaring; requires companies to pay royalties on vented and flared gas

Hong Kong (HKG) | Created a facility to produce energy from sewage sludge, providing its own power to handle the waste

Ontario (CAN) | Requires landfill gas collection and flaring or use for landfills larger than 1.5 million cubic meters

Iowa (USA) | Exempts from property tax any properties used to convert waste to gas, to collect methane or other gases, to convert the gas to energy, or to collect waste for these purposes
Finance cuts across all of the sectors covered in this book, and is a key enabler for all of the recommendations. Regional governments operate at a scale that lends itself well to organizing and delivering financial solutions, and realizing scale benefits. These finance recommendations are highly variable, with solutions that are very dependent on the local economic and regulatory contexts. Each recommendation is portrayed as a broad strategy, with more detailed information on specific opportunities.
Solution Options

1. Public-Private Partnerships/Green Banks

The efficient use of limited public resources can make projects more attractive to the private sector, leveraging much larger amounts of private investment for low-carbon solutions. Judiciously using public resources can help overcome market barriers and increase market activity by crowding in private sources of capital. A good example of public-private partnerships is green investment banks (GIBs). GIBs are public-purpose finance institutions designed to facilitate private investment in local low-carbon, climate-resilient projects by focusing on gaps in the market. They can be used to support small, decentralized efforts or major infrastructure projects. Some entities use a dedicated tax for specific projects to raise infrastructure funds.

Context

Best for places with strong capital markets

Action Documents

Find action documents at rmi.org/carbonfreeregions

- Bulgaria program overview and details
- Connecticut Public Act 11-80 creating the green bank and the bank’s legislative mandate
- Rhode Island legislation creating an infrastructure fund

Global Spotlights

Armenia (ARM)
North Brabant (NLD)
Bulgaria (BGR)
New York (USA)

Recommended Resources

Find resources at rmi.org/carbonfreeregions

- Green Bank Network
- Coalition for Green Capital
- Founding Charter for Armenia’s government-created energy financing NGO and general information (in Armenian)
- Queensland infrastructure fund
- Armenian legislation for green funds
- NY Green Bank

Capital Availability

Make capital available to finance projects

Invest capital into the infrastructure and assets of a community. Sources of capital must be secured to make those investments possible and to realize the wide range of benefits that those investments provide to the community.
2. Concessionary Capital
Some philanthropic organizations provide investment dollars for program-related investments (PRIs). Because the investments are aligned with missions, they can usually offer more favorable terms. Some socially minded venture capital firms offer similar solutions.

Action Document
Find action documents at rmi.org/carbonfreeregions
- Draft legislation to allow social investment

Global Spotlight
Ontario (CAN) | Refined its laws to facilitate social investing

Recommended Resource
Find resources at rmi.org/carbonfreeregions
- Overview and searchable database

3. Green Bonds
Green bonds are regular government or corporate bonds, the proceeds of which are earmarked for use only for projects that have positive environmental impacts. These bonds broaden the investor base and are tracked to ensure they are used for environmental projects. As a variation, a revenue bond can be issued against infrastructure projects with a dedicated income stream, such as utility services.

Context
Only for countries with bonding capacity

Action Document
Find action documents at rmi.org/carbonfreeregions
- How to Issue a Green Muni Bond

Global Spotlights
La Rioja (ARG)
Hong Kong (HKG)
Queensland (AUS)

Recommended Resources
Find resources at rmi.org/carbonfreeregions
- Green Bonds playbook and resources
- Green Bond Principles 2017
- External review of Quebec’s Green Bond program
- Climate Bonds Standard
- Green Bond project review in France

4. Preinvestment Preparation
Local governments often need support to improve the financial design of project plans in order to attract capital investments. Multilateral funds are sometimes provided to developing countries. Preinvestment services can be financed to leverage larger-scale investments.

Context
All regions, though often with specific funds for low-income countries

Action Documents
In this case, documents for taking action are not replicable

Global Spotlight
Loh Djiboua (CIV) | Secured financing for a feasibility study to support the creation of five sorting and composting stations

Recommended Resources
Find resources at rmi.org/carbonfreeregions
- R20’s Energy and waste project facilitator programs
- Subnational Climate Fund for Africa
- European Investment Bank
- Public-Private Infrastructure Advisory Facility funds and resources
### Solution Options

#### First-Cost Solutions

**Develop financing mechanisms to reduce/eliminate first-cost concerns**

Develop financing solutions that can cover the up-front costs for carbon-reduction actions that will create financial savings in the long term. These solutions will unlock more action, remove financial burdens associated with new requirements, and deliver greater financial benefits to those private stakeholders. The government’s role in these solutions can vary, with some requiring enabling legislation (e.g., property assessed clean energy programs) and others that are newer innovations needing support and introduction to the market (e.g., green leases).

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#### 1. Energy Savings Performance Contracts

Energy savings performance contracts (ESPCs) are contracts with a private energy services company to evaluate and deliver cost-effective energy upgrades to a facility and pay for those upgrades with the energy savings, providing a guaranteed savings and the private financing to make the upgrades. Regions can organize programs or pass legislation to allow and encourage ESPCs.

**Action Documents**

Find action documents at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- **Plan of Energy and Climate Change 2012–2020**, which includes provisions for energy contracting with guarantees (in Catalan)
- **Clean Energy Investment Program**
- **Sample RFPs and other resources**

**Global Spotlights**

- Catalonia (ESP)
- New Jersey (USA)
- Upper Austria (AUT)

**Recommended Resources**

Find resources at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- All US state laws for ESPCs
- [Practices and Opportunities for Energy Performance Contracting in the Public Sector in EU Member States](http://rmi.org/carbonfreeregions)
- [Energy Savings Performance Contract Toolkit](http://rmi.org/carbonfreeregions)
- [Energy Performance Contracting: Modernising Buildings with Guarantees](http://rmi.org/carbonfreeregions)
- [Report on the Catalan and Spanish EPC Markets](http://rmi.org/carbonfreeregions)

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#### 2. Total Cost of Ownership Procurement Reform

Incorporating a total cost of ownership policy for the government and within the community will drive procurement decisions that include operating and maintenance costs. This approach supports greater energy efficiency, which may be discouraged by status-quo procurement policies that rely on low purchase costs.

**Action Documents**

Find action documents at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- Scotland’s Procurement Strategy
- Massachusetts’ Environmental Purchasing Executive Order 515
- New South Wales’s procurement directive

**Global Spotlights**

- Scotland (GBR)
- Catalonia (ESP)
- New South Wales (AUS)

**Recommended Resources**

Find resources at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- Various low-carbon best practice tenders
- National Association of State Procurement Officials Green Purchasing Guide
- Local Government Green Procurement Guide
- Guidance for Leadership in Sustainable Purchasing 2.0
- Institute for Public Procurement's white paper on total cost of ownership
- Introduction to total cost ownership

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**Global Spotlights**

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- Catalonia (ESP)
- New South Wales (AUS)

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- Various low-carbon best practice tenders
- National Association of State Procurement Officials Green Purchasing Guide
- Local Government Green Procurement Guide
- Guidance for Leadership in Sustainable Purchasing 2.0
- Institute for Public Procurement’s white paper on total cost of ownership
- Introduction to total cost ownership
3. Green Leasing
Leasing arrangements typically create a “split incentive” where building owners have little incentive to invest in energy-related capital improvements because the tenants pay the utility bills and benefit from the lower energy use. With green leasing (or energy-aligned leasing), tenants and landlords share the costs and the benefits of site energy upgrades, which can include building efficiency and renewable generation.

**Action Document**
Find action documents at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- **UK Green Leasing Toolkit** with best practice legal language

**Global Spotlights**
France (FRA)
United Kingdom (GBR)
Australia (AUS)

**Recommended Resources**
Find resources at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- Green Lease Library
- Landlord Tenant Energy Partnership

4. Property Assessed Clean Energy
Property assessed clean energy (PACE) programs allow building owners to secure funds for energy-efficiency upgrades, and pay them back through their property tax assessments because of a public-private partnership. The result is that funds can be provided based on real estate values rather than personal or corporate credit, repayment is done through the existing tax mechanism, and the financing stays with the building rather than moving with the individual or company. PACE is active in over 20 US states, and residential PACE programs in only three states have unlocked a $5 billion market. PACE-like instruments are being developed in places like China and Europe.

**Action Documents**
Find action documents at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- Australian legislation, called Environmental Upgrade Agreements
- Updated consumer protections for PACE, CA Assembly bill and CA Senate bill

**Global Spotlights**
Ontario (CAN)
Victoria (AUS)
Florida (USA)

**Recommended Resources**
Find resources at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- US PACE laws, market data, and other resources
- *Best Practice Guidelines for Residential PACE and Lessons in Commercial PACE Leadership*

5. On-Bill Financing
Financing from public or private sources can be provided to bill-payers through the utility, creating a convenient option for customers, who can see the savings on their bills and pay all their energy-related costs in one place. This approach can also provide a viable business model for utilities to encourage their support of energy improvements in their service territories.

**Action Documents**
Find action documents at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- List of all US state legislation for on-bill financing programs
- Program Design Guidelines from the State and Local Energy Efficiency Action Network

**Global Spotlights**
Wales, England, and Scotland (GBR)
New York (USA)
Minnesota (USA)

**Recommended Resources**
Find resources at [rmi.org/carbonfreeregions](http://rmi.org/carbonfreeregions)

- The American Council for an Energy-Efficient Economy’s On-Bill Energy Efficiency
- Green Deal program in the UK
1. Carbon Tax/Greenhouse Gas Trading
Support emissions reductions by putting a price on carbon—a carbon tax or fee—which will drive down emissions as polluting becomes more expensive. Alternatively, support setting emissions reductions targets, capping the total amount of allowable emissions, and allowing the market to determine the price with a greenhouse gas cap-and-trade policy. By putting an economic cost on carbon and creating a market for carbon-saving endeavors, governments can create market conditions that support carbon-saving solutions.

Action Documents
Find action documents at rmi.org/carbonfreeregions
- British Columbia carbon tax legislation
- Alberta Bill 20 Climate Leadership Implementation Act (includes a carbon levy)
- State statutes and legislation for members of the Regional Greenhouse Gas Initiative’s carbon trading policy

Global Spotlights
Guangdong (CHN) | Ireland (IRL)
Zimbabwe (ZWE) | California (USA)
European Union (EU)

Recommended Resources
Find resources at rmi.org/carbonfreeregions
- Carbon Tax Center
- Zimbabwe’s Carbon Tax
- Japan’s Carbon Tax
- World Bank/Ecofys State of Carbon Pricing 2017
2. Investment Tax Credits
Provide tax credits for projects that include renewable energy or energy-efficiency measures. Tax credits can be applied in several areas, including property taxes, income tax, value-add taxes, and others.

Action Documents
Find action documents at rmi.org/carbonfreeregions
- Madhya Pradesh solar tax credit (and other policies)
- Santa Cruz tax exemption and credits for wind and solar (in Spanish)

Global Spotlights
Madya Pradesh (IND)
Santa Cruz (ARG)

Recommended Resources
Find resources at rmi.org/carbonfreeregions
- Taxes and incentives for renewable energy
- Africa Incentive Survey

3. Incentives for Clean Technology Companies
Create incentives for clean technology companies, including economic development grants, tax incentives, and public venture capital programs.

Action Documents
Find action documents at rmi.org/carbonfreeregions
- Massachusetts law creating a state economic development office for clean technology
- North Rhine-Westphalia program to provide direct incentives to purchasers (in German)

Global Spotlights
Henan (CHN)
North Rhine-Westphalia (DEU)
North Carolina (USA)

Recommended Resources
Find resources at rmi.org/carbonfreeregions
- Global Cleantech Cluster Association
- International Cleantech Network

“Our goal in North-Rhine Westphalia is to become one of the most climate friendly industrial regions in the world. Therefore, we foster innovation as well as cooperation between start-ups, traditional industry, and our science community.”
—Prof. Dr. Andreas Pinkwart, Minister for Economic Affairs, Innovation, Digitalization, and Energy, State of North-Rhine Westphalia, Germany
Solution Options

Reduced Procurement Costs
Reduce procurement costs through regional collaboration structures

Regional governments are well positioned to organize programs that will lower the cost to procure upgrades and assets, such as solar installations, electric vehicles, and air-source heat pumps. By organizing these programs at scale, greater cost reductions can be achieved for constituents across the region.

1. Reverse Auctions for Procurement
In a reverse auction, the sellers are competing to provide the lowest price, as opposed to a traditional auction where buyers are competing for a higher price. Using this approach for energy-related procurements can effectively secure lower costs, as long as other quality requirements are clearly defined.

Action Documents
Find action documents at rmi.org/carbonfreeregions

- Gujarat Request for Selection
- Australian Capital Region Feed-In Tariff Act, which creates provisions for reverse auctions

Global Spotlights
Gujarat (IND)
Australian Capital Region (AUS)
São Paulo (BRA)

Recommended Resources
Find resources at rmi.org/carbonfreeregions

- Overview and evaluations of ACT’s reverse auctions
- Case study of São Paulo program

2. Aggregate Purchasing Programs
Organize aggregate (or bulk) purchasing opportunities for local governments and private businesses or citizens to secure lower prices and create a time-bound trigger to spur action. These can be direct equipment purchases or power purchase agreements.

Context
Aggregation of power purchase agreement is best done in liberalized markets

Action Document
Find action documents at rmi.org/carbonfreeregions

- US state statutes for power purchase agreements

Global Spotlights
Zhejiang (CHN)
Michigan (USA)

Recommended Resource
Find resources at rmi.org/carbonfreeregions

- Go Green Purchasing for US local governments
General Resources

- The Under2 Coalition
- R20 Regions of Climate Action
- Digital Environmental Legislative Handbook, USC Schwarzenegger Institute
- EU’s Regional Clusters in Energy Planning
- National Conference of State Legislatures’ energy bill database
- America’s Pledge on Climate Change
- World Resource Institute’s ClimateWatch
- How Improved Land Use Can Contribute to the 1.5°C Goal of the Paris Agreement, working paper prepared by Climate Focus and the International Institute for Applied Systems Analysis
- McKinsey and Company’s Decarbonization of Industrial Sectors: The Next Frontier

Version and Evolution

This is Version 1 of The Carbon-Free Regions Handbook. This space is evolving fast, and we are collectively learning, innovating, and proving more solutions every year. This book represents a snapshot of the high-impact, no-regrets actions of today (2018), but these are just the starting points. We have surely missed some great examples throughout the world, and we welcome recommendations and suggestions, which we will endeavor to share with the community.

Although we focused this handbook on proven solutions, forward-looking states, provinces, and regions may pioneer emerging practices so that they can become proven strategies for others. We invite regional governments to reach out to us as they implement high-impact programs like these. With enough new information and interest, we may produce future versions updated with new insights.

Links to these resources, as well as to other sources of information found throughout the book, are available online and in the PDF version of this handbook, available at rmi.org/carbonfreeregions.
The Path Forward

1. Identify Relevant Recommendations, Based on Local Conditions and Emission Sources

2. Connect with Regional Networks

3. Engage Stakeholders

4. Take Action

5. Share the Results
Conclusion

The time to act is now. Fortunately, momentum is building around the world. Renewable energy capacity is growing by leaps and bounds, and more and more governments are passing laws to address climate change. And you don’t have to wait for your national government to take action—states, provinces, and regions can lead the action and make the changes the world desperately needs. The actions in this handbook are ready to launch now; don’t wait for someone else to lead the way.

Join the exciting movement of regions around the world that are taking steps to not only solve climate issues, but also solve energy, employment, resiliency, equity, and health issues, all at the same time. We have much at risk, but the solutions aren’t just about doing the right thing. They also create a path to a vibrant, thriving future that we should pursue regardless of the threat of climate change.

We thank you for your interest in learning how your community can be carbon-free, and for taking action to make it possible. Please let us know what you do in this space and how you’re driving change. We look forward to featuring your work in the future.

Dr. Martin Luther King, Jr. spoke with long-term vision when addressing the civil rights of African-Americans. Climate change threatens to create a massive new civil rights problem. Given this new, additional threat, Dr. King’s warning applies to the issue of climate change as well.

“We are now faced with the fact that tomorrow is today. We are confronted with the fierce urgency of now.... Procrastination is still the thief of time ... Over the bleached bones and jumbled residue of numerous civilizations are written the pathetic words: ‘Too late.’ There is an invisible book of life that faithfully records our vigilance or our neglect.”

—Dr. Martin Luther King, Jr.
The Carbon-Free Regions Handbook

Find all of the action documents, a free digital copy of the entire handbook, and other content for each recommendation at rmi.org/carbonfreeregions

The Carbon-Free City Handbook

The Carbon-Free City Handbook is an important companion to this guidebook, which regional governments should share with cities within their jurisdiction. It offers 22 no-regrets, transformational recommendations for cities around the world. It includes action documents and additional resources to help cities take immediate action and move from concept to impact.

Find it at: rmi.org/carbonfreecities