



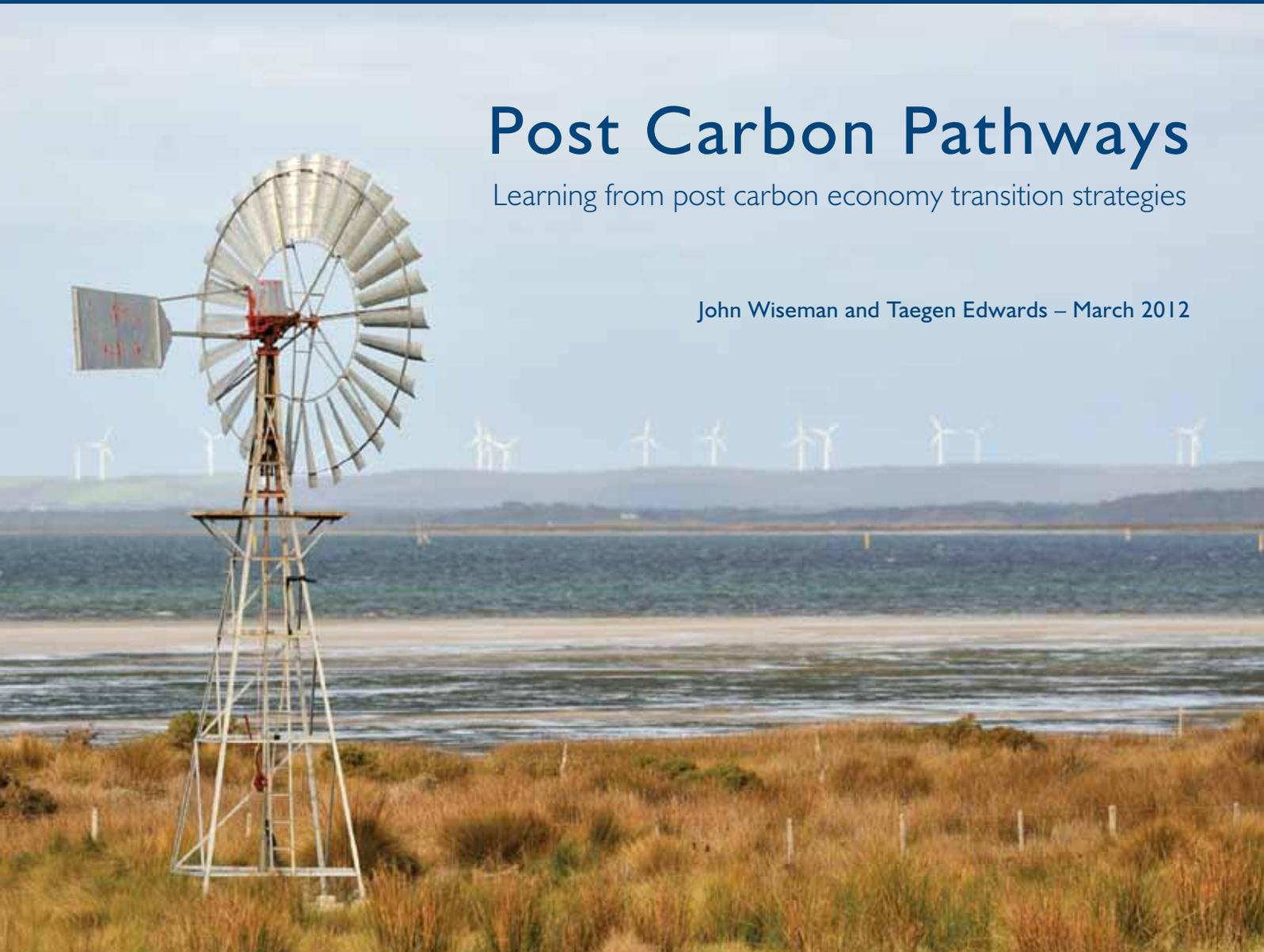
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Post Carbon Pathways

Learning from post carbon economy transition strategies

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This policy brief is a summary of key findings from the Post Carbon Pathways report, which provides a concise overview of the goals and priorities of 18 of the most ambitious and innovative large-scale post carbon economy transition strategies.

The report is the first stage in an ongoing project designed to strengthen understanding of the most effective ways of overcoming barriers to the rapid implementation of large-scale post carbon economy transition strategies.

The full report, produced in partnership with the Centre for Policy Development, can be found at <http://www.sustainable.unimelb.edu.au/content/pages/post-carbon-pathways> or visit www.postcarbonpathways.net.au for more information.

The necessity and possibility of a rapid transition to a just and sustainable post carbon future

While increased public acceptance of the necessity of urgent climate change action is crucial, the transformational changes required to rapidly reduce greenhouse gas emissions also depend on broad recognition that alternative, more desirable futures and pathways are possible.

The growing array of integrated post carbon transition plans and strategies provides an important foundation for meeting this challenge. There is much to be learned from the innovative ways in which these strategies have been designed and developed. The crucial next step is to embed post carbon transition planning at the heart of political debate and public policy – leading to system-wide actions that achieve a rapid reduction in greenhouse gas emissions.

Scope, scale and methodology

The *Post Carbon Pathways* report focuses on comprehensive large-scale post carbon economy transition strategies developed by government and non-government organisations. The strategies selected for analysis meet some or all of the following criteria:

- Emissions reductions and renewable energy goals and targets at a scale and speed broadly consistent with outcomes needed to prevent runaway climate change
- Significant potential to be rapidly accelerated and/or scaled up
- Significant potential to inform post carbon economy transition planning in other jurisdictions.

The Australian Government's low carbon economy plan, *Securing a Clean Energy Future*, has been included, given its central role in setting current

policy and political agendas in the Australian context.

The selection and analysis of strategy documents have been based on an extensive desk-top survey augmented by consultation with a range of researchers and policy makers with relevant experience and expertise. The authors are conscious that this is a large and rapidly evolving field and we welcome further advice about updated strategy proposals as well as suggestions about additional ambitious and innovative initiatives.

Table 1 provides contact details and sources for the transition strategies summarised in this report.

Table 2 provides an overview of key features of each of the strategies including key targets, policy priorities and approximate costings.

Table 3 provides an overview of the theories of social and political change underpinning each of the strategies.





Table 1: Selected post carbon economy transition strategies

Strategy	Weblink
World in Transition: A Social Contract for Sustainability – German Advisory Council on Global Change	http://www.wbgu.de/en/flagship-reports/fr-2011-a-social-contract/
World on the Edge: How to Prevent Environmental and Economic Collapse – Lester R. Brown, Earth Policy Institute	http://www.earth-policy.org/books/wote
Our Choice: A Plan to Solve the Climate Crisis – Al Gore	http://ourchoicethebook.com/
One Degree War Plan – Paul Gilding and Jorgen Randers	http://www.emeraldinsight.com/journals.htm?articleid=1860356 http://paulgilding.com/the-great-disruption
Powering a Green Planet: A Path to Sustainable Energy by 2030 – Mark Z. Jacobson and Mark A. Delucchi	http://www.scientificamerican.com/article.cfm?id=a-path-to-sustainable-energy-by-2030
The Energy Report: 100% Renewable Energy by 2050 – WWF International	http://wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions/renewable_energy/sustainable_energy_report/
Zero Carbon Britain 2030 – Centre for Alternative Technology	http://zerocarbonbritain.org/
Low Carbon Growth Plan for Australia – Climate Works Australia	http://www.climateworksaustralia.com/low_carbon_growth_plan_australia.html
Zero Carbon Australia 2020: Stationary Energy Plan – Beyond Zero Emissions and Energy Research Institute, University of Melbourne	http://beyondzeroemissions.org/zero-carbon-australia-2020
A Roadmap for Moving to a Competitive Low Carbon Economy in 2050 – European Commission	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:EN:PDF
The Carbon Plan: Delivering our low carbon future – Government of the United Kingdom	http://www.decc.gov.uk/en/content/cms/tackling/carbon_plan/carbon_plan.aspx
National Strategy for Green Growth – Government of the Republic of Korea	http://www.greengrowth.go.kr/english/en_main/index.do
12th Five-Year Plan and White Paper of China's Policies and Actions in Responding to Climate Change – Government of the People's Republic of China	http://cbi.typepad.com/china_direct/2011/05/chinas-twelfth-five-new-plan-the-full-english-version.html http://www.gov.cn/english/official/2011-11/22/content_2000272.htm
National Action Plan on Climate Change and Low Carbon Strategies for Inclusive Growth: An Interim Report – Government of India	http://pmindia.nic.in/Pg01-52.pdf http://planningcommission.nic.in/reports/genrep/Inter_Exp.pdf
Securing a Clean Energy Future – Government of Australia	http://www.cleanenergyfuture.gov.au/clean-energy-future/our-plan/
Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply – Government of Germany	http://www.bmu.de/files/english/pdf/application/pdf/energiekonzept_bundesregierung_en.pdf
Our Future Energy – Government of Denmark	http://ens.netboghandel.dk/publikationer/publikationsdetaljer.aspx?Pld=5308989e-ea64-436b-8346-4e29c8a84d62
Climate Change Scoping Plan and California's Clean Energy Future – Government of California	http://www.arb.ca.gov/cc/scopingplan/document/scopingplan_document.htm http://www.cacleanenergyfuture.org/

Key findings

1. Pathways to creating a post carbon future at the required scale and speed remain open – but the gateway for effective action to prevent runaway climate change is closing fast.

There is now a wide range of detailed national and global level strategies demonstrating that a rapid transition to a post carbon economy is both technologically and economically feasible. However, action in the next five to ten years will be critical.

The toughest and most urgent questions are:

- For less ambitious plans and strategies (generally government-led): Given that the proposed actions do not match the physical requirements of action needed to prevent runaway climate change, what can be done to bridge this gap?
- For more ambitious plans and strategies (generally non-government authored): Given that political and social support for the rapid implementation of these proposals remains challenging, what can be done to bridge this gap?

2. The post carbon economy toolkit is now clear: An equitable and swift transition to a sustainable post carbon economy will require:

- Rapid reductions in energy consumption and improvements in energy efficiency
- Rapid replacement of fossil fuels by renewable energy
- The draw down and sequestration of carbon into sustainable carbon sinks
- Economic policies informed by recognition of the full costs of failing to reduce emissions and of the co-benefits of the transition program
- A significant shift towards economic priorities focusing on improving

social and ecological wellbeing rather than unconstrained growth in material consumption

- Equitable and timely adaptation policies.

3. Technological barriers are not the most significant obstacles to the transition to a post carbon economy at the speed and scale required to significantly reduce the risk of runaway climate change.

Deployment of combinations of existing energy efficiency, renewable energy, land use technologies and innovations can deliver emissions reductions at the required speed and scale.

4. The financial and social impacts of economic and industrial restructuring represent a significant but not insurmountable obstacle.

Many plans and strategies note the importance of strengthening understanding of the economic and social costs of failing to take action to reduce emissions – and of the multiple employment, health and social equity co-benefits of a swift transition to a post carbon economy.

Most strategies include a mix of market based and regulatory policies, underpinned by clear long-term emissions reduction targets. The authors of some strategies, however, remain cautious of over reliance on carbon pricing, placing stronger emphasis on more direct interventions to drive a rapid transition from fossil fuels to renewable energy including: binding renewable energy targets; feed-in tariffs; elimination of fossil fuel subsidies; and closing fossil fuel power stations.

Strategies with ambitious emissions reduction targets generally include a strong emphasis on the need to dramatically rethink current assumptions about the nature and level of growth in material consumption.

The most common ballpark estimates of the costs of actions required to rapidly decarbonise the global economy are in the order of US\$1,000 billion pa to 2030.

To give some sense of perspective, the United States Government funds allocated to the 2011 Troubled Asset Relief Program (TARP) supporting the 'bail out' of the US banking system amounted to US\$700 billion.

5. There is no solution to climate change without climate justice

While all strategies are informed by an implicit commitment to improving outcomes for future generations, there is considerable potential for the ethical implications of intergenerational equity to be articulated more strongly. There is widespread recognition that broad political support for a rapid transition to a post carbon economy will depend on the implementation of policies which address and overcome key social equity challenges. The primary focus of many of the government-approved plans is on overcoming social equity at the national rather than international level.

6. The biggest barriers preventing a rapid transition to a post carbon future are social and political – not technological and financial.

Strategies for mobilising the required level of political leadership and public support remain the most significant gap in most post carbon economy transition plans.

A rapid transition to a post carbon economy is likely to require a strong leadership role for national governments in setting and achieving clear long-term emissions reduction targets combined with strengthened grassroots mobilisation and enhanced global cooperation.

Developing and communicating inspiring stories and compelling images of a just and sustainable post carbon future will be crucial.

Next steps: Policy and research priorities

Key policy and research priorities arising from the analysis of transition strategies in this report include further clarification and communication of scientifically informed knowledge about:

- The scale and speed of global, national and local emissions reductions required to significantly reduce the risk of runaway climate change
- Economic and social policies providing the most effective and equitable basis for achieving emissions reductions at the required speed and scale

- Political and social change strategies leading to rapid implementation of the policies needed to drive a swift transition to a just and sustainable post carbon economy.

The second phase of the Post Carbon Pathways research project will focus on the following questions:

- Which large-scale post carbon economy transition strategies have been most effective in:
 - influencing public debate;

- influencing the attitudes and actions of key stakeholders and decision makers;
- driving rapid implementation of post carbon economy policies; and

- driving rapid reductions in GHG emissions.

- What have been the major barriers limiting the effectiveness and preventing the rapid implementation of large-scale post carbon economy transition plans? What have been the most effective strategies for overcoming these barriers?



Table 2: Post carbon economy transition strategies: Summary of key features

Strategy	Energy and emissions targets	Energy supply assumptions and priorities	Significant questioning of current economic paradigm	Approximate cost of transition policies <small>(Most costings assume significant net savings compared to 'Business as Usual')</small>
World in Transition	Decarbonise global energy system by 2050	Renewables; No nuclear; Possibly CCS	Yes	Additional net investment US\$200 and US\$1,000 billion pa by 2030
World on the Edge	Cut global CO ₂ emissions by 80% by 2020 (on 2006 levels)	Renewables; No nuclear or CCS	Yes	Net cost US\$200 billion pa
Our Choice	Rapid reduction to 350ppm atmospheric CO ₂ concentration	Renewables, nuclear, CCS all considered	Yes	Does not include detailed costings
One Degree War Plan	Cut global GHG emissions to zero over 15 years; negative emissions for rest of century	Renewables; Low possibility of nuclear and CCS	Yes	Carbon tax expected to generate US\$2,500 billion pa by year 5 to fund transition
Powering a Green Planet	Switch global energy system to 100% renewable energy (wind, water, solar) by 2030	100% Renewables: Wind, water and solar	No	Ballpark figure of US\$100 trillion over 20 years in gross investment to construct global renewable energy systems. Business-as-usual will cost approx US\$10 trillion (not inc. mounting social costs)
The Energy Report	Peak and decline global GHG emissions within 5 years, reduce by 80% by 2050 (on 1990 levels); 100% renewable energy by 2050	Renewables; No nuclear or CCS; 5% fossil fuels	No	Total cost of achieving targets approx €1 trillion pa. Investment expected to have paid itself off by around 2040 at latest
Zero Carbon Britain 2030	Reduce net UK GHG emissions to zero by 2030	Renewables; No CCS; No new nuclear	Yes	Ballpark figure of £50 billion pa required for initial investment program
Climate Works Low Carbon Growth Plan for Australia	Reduce Australian GHG emissions by 25% by 2020	Fossil fuels, Renewables and CCS	No	AU\$1.8 billion per year. Strong emphasis on net savings to business
Zero Carbon Australia Stationary Energy Plan	Reduce net Australian GHG emissions to zero by 2020; 100% of stationary energy from renewables by 2020	100% Renewables	No	AU\$37 billion pa for ten-year period, or approx 3% of Australian GDP. Net present costs over longer time period (2010–2040) roughly equivalent to business-as-usual (not inc. transport savings)
European Commission: Roadmap 2050	Reduce EU GHG emissions by 20% by 2020 and 80–95% by 2050 (on 1990 levels)	Renewables; CCS; Nuclear	No	Approx €270 billion pa over 40 years (approx 1.5% of EU GDP pa above 2009 investment levels). Savings from €175–320 billion pa (not incl. saving on social costs)

Strategy	Energy and emissions targets	Energy supply assumptions and priorities	Significant questioning of current economic paradigm	Approximate cost of transition policies <small>(Most costings assume significant net savings compared to 'Business as Usual')</small>
UK: Carbon Plan	Reduce UK GHG emissions by 34% by 2020 and 80% by 2050 (on 1990 levels)	Fossil fuels (shift to gas); Nuclear; CCS; Renewables	No	Total net present cost over lifetime of policies in past carbon budget periods approx €9 billion. Average cost approx 0.4% of UK GDP pa from 2008–2022 and 0.6% of UK GDP per year over 2023–2027
South Korea: Green Growth Strategy	Reduce Korean GHG emissions by 30% below projected 2020 levels (equivalent to 4% reduction on 2005 levels)	Fossil fuels; Nuclear; Renewables	No	Total investment announced as part of Five Year Plan (2009–2013) US\$83.6 billion
China: 12th Five Year Plan & Climate Change White Paper	Reduce Chinese CO ₂ emissions per unit of GDP by 40–45% by 2020 (on 2005 levels)	Fossil fuels (incl. unconventional oil and gas); CCS; Nuclear; Renewables	No	Total investment (both public and private) in new energy of approx RMB5 trillion (US\$760 billion) over next 10 years
India: National Action Plan; Low Carbon Growth Report	Reduce India's emissions intensity of GDP by 20–25% by 2020 (on 2005 levels)	Fossil fuels; Possibly CCS; Nuclear; Renewables	No	Does not include detailed costings
Australia: Clean Energy Future	Reduce Australian GHG emissions by 5% by 2020 and 80% by 2050 (on 2000 levels)	Fossil fuels; CCS; Renewables	No	Carbon price and related measures to raise approx AU\$25.5 billion in the period 2011–2015. Further AU\$3.9 billion public funds to augment
Germany: Energy Concept	Reduce German GHG emissions by 40% by 2020 and at least 80% by 2050 (on 1990 levels)	Renewables; Possibly CCS; Phase-out nuclear	No	Additional investment €20 billion pa, offset by energy cost savings
Denmark: Our Future Energy	100% renewable energy in all Danish energy supply by 2050	100% Renewables	No	Cost to 2020 approx DKK5.6 billion (US\$952 million). Immediate net costs of < 0.25% GDP in 2020. Average additional costs to Danish households approx DKK1,700 (US\$289) in 2020
California: Scoping Plan & Clean Energy Future Plan	Reduce GHG emissions to 1990 levels by 2020 and 80% of 1990 levels by 2050; 33% of electricity from renewable energy by 2020	Fossil fuels; Possibly CCS; Renewables	No	Ongoing costs approx US\$36 million pa. Benefits by 2020 (compared to business-as-usual) inc. increases in economic production of US\$33 billion and overall gross state product of US\$7 billion

Table 3: Post carbon economy transition strategies: Theories of social and political change

Strategy	Theories of social and political change
World in Transition	<p>Key conditions for creating social dynamics for change: well informed, shared visions of desirable future; strong and effective change agents and champions; social and economic 'shocks'; proactive state and supportive global governance structures; high level of citizen participation.</p> <p>Strategic opportunities for overcoming barriers to transformational change:</p> <ul style="list-style-type: none"> • Rapid advances in low carbon technology innovation • Recognition that required investments are viable when compared with greater costs of inaction • Changing values towards sustainability • Global knowledge networks • Recognition of co-benefits of transformational change.
World on the Edge	<p>Transition requires decarbonisation at 'wartime speed'. Three social change models:</p> <ul style="list-style-type: none"> • Pearl Harbour: Dramatic event leads to fundamental change (Too risky?) • Berlin Wall: Social tipping point reached after gradual change in thinking and attitudes (Too slow?) • Sandwich: Grassroots movement strongly supported by political leadership. (Preferred)
Our Choice	<p>Overcoming social, political and attitudinal barriers to climate action requires visionary leadership combined with broad community mobilisation. Need to hold corporations to account and ensure higher standards in media.</p>
One Degree War Plan	<p>Prevention of catastrophic climate change requires broad support for comprehensive action at scale and speed comparable to World War II mobilisation. At some point (before 2020?) one or more critical ecological, economic or social tipping point events likely to occur, leading to rapid shift in public support for action required.</p>
Powering a Green Planet	<p>Obstacles to implementation of 100% global renewable energy system by 2030 'primarily social and political, not technological'. Need for strong leadership to avoid dominance of industry-preferred technologies.</p>
The Energy Report	<p>Reduction in energy demand from energy efficiency savings, rather than restrictions on human activities. Emphasis on human ingenuity, technological innovation and behavioural change as key drivers of societal transition.</p>
Zero Carbon Britain 2030	<p>Notes dynamic nature of politics and role of sudden, unexpected events in driving dramatic political shifts. Importance of having plans in place to avoid predictable, but uncertain, shocks (e.g. peak oil). Importance of behaviour change plus promotion of wider societal dialogue on values, structures and processes which have led to overconsumption, climate change and resource depletion.</p>
Climate Works Low Carbon Growth Plan for Australia	<p>Focus on winning support from key industry sectors and stakeholders as basis for winning broader social and political support.</p>
Zero Carbon Australia Stationary Energy Plan	<p>Need for 'decisive leadership' from government, business, academia and the wider community to implement the plan. Focus on contributing to settling debate on technical feasibility of 100% renewable energy in Australia to enable social and political changes to occur.</p>
European Commission: Roadmap 2050	<p>Political and social change factors not covered in detail, although notes importance of policy innovation, behaviour change and public education programs.</p>
UK: Carbon Plan	<p>Importance of UK Government, industry and citizens to be 'pulling in the same direction' in order to achieve low carbon transition.</p>
South Korea: Green Growth Strategy	<p>Primary emphasis on education and raising public awareness about need for lifestyle change needed to support green growth.</p>
China: 12th Five Year Plan and Climate Change White Paper	<p>Underlying assumption of strong and ongoing role for co-ordinated government planning and intervention, consistent with overall Chinese economic and political governance arrangements.</p>
India: National Action Plan; Low Carbon Growth Report	<p>Political and social change factors not covered in plans considered. Notes need for the final report to include discussion of barriers to implementation or adoption by people and firms of Indian climate change policies.</p>
Australia: Clean Energy Future	<p>Carbon price as central driver of change. Strong emphasis on limited impact of policy measures on Australian economy and lifestyles.</p>
Germany: Energy Concept	<p>Importance of building public understanding and support for transition. Measures include provision of comprehensible information, transparent decision making and opportunities for public dialogue.</p>
Denmark: Our Future Energy	<p>Elements contributing to social and political acceptance of Denmark's energy transition not covered in this strategy. Assumes strong ongoing role for government in encouraging innovation and community education.</p>
California: Scoping Plan and Clean Energy Future Plan	<p>Active public participation essential. Emphasis on role for market forces and growing environmental awareness to shift individual choices and attitudes. Calls for targeted public outreach, marketing and education programs.</p>