The socio-political merit order

Developing energy strategies that can be rapidly deployed

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1 Limits to least-cost modelling

In his final interview, the late David MacKay made a statement worth pondering. As a consultant to the UK Department of Energy and Climate Change, he had advised against supporting the application of solar PV energy. His analysis had shown that solar PV would just add costs to the system. He stated:

> *"The only reason that solar got on the table was because of democracy. The MPs wanted to have a solar feed-in tariff."*[1]

Decision-making processes go far beyond the techno-economic reality of the available solutions, and energy efficiency is another example that supports this claim. Nowadays, many call energy efficiency the first fuel, as it is considered a cheap and an easy fix. Andris Piebalgs, former EU Commissioner for Energy, instead compared it to renewable energy sources:

> *"Energy efficiency involves a lot of nitty-gritty, a lot of incentives and a lot of regulations. And there's no ribbon to cut. It's very important to be able to cut a red ribbon*."[2]

These are both examples of how policymakers deviate from what energy analysts consider the best solution. Today, almost all energy modelling is based on least-cost optimisation. That is the case for integrated assessment models for modelling global climate change, and for models that are used for analysing national energy and climate policies. There is a wide variety of optimisation and simulation routines within such models,[3] but as a rule of thumb they aim at selecting the options that have the lowest costs. Commonly, optimisation is performed by taking into account certain constraints, e.g., a constraint to the emissions allowed, or—at a global level—to the global temperature increase allowed within this century.

Least-cost modelling has its merits. Financial resources are limited, and it is valuable to know how certain objectives can be achieved at the lowest costs. However, the quotes above illustrate that there is a ceiling to the usefulness of least-cost modelling. Some options and some technologies resonate better than others—in society and in policymaking. Given the fact that a rapid transition to a low carbon energy system is necessary, there is a strong push for options and technologies that are well accepted in society: by citizens, by companies, by nongovernmental organisations, and by policymakers. Alternatives that are subjectively most preferred are likely to gain the most momentum, and are consequently most likely to make a difference over the next 2-3 decades.

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[1] David MacKay, interview by Mark Lynas, "David MacKay – Final Interview and Tribute," YouTube, April 2016, https://www.youtube.com/watch?v=sCyidsxIDtQ

[2] Daniel Yergin, *The Quest: Energy, Security, and the Remaking of the Modern World* (London: Penguin Books, 2012), 631.

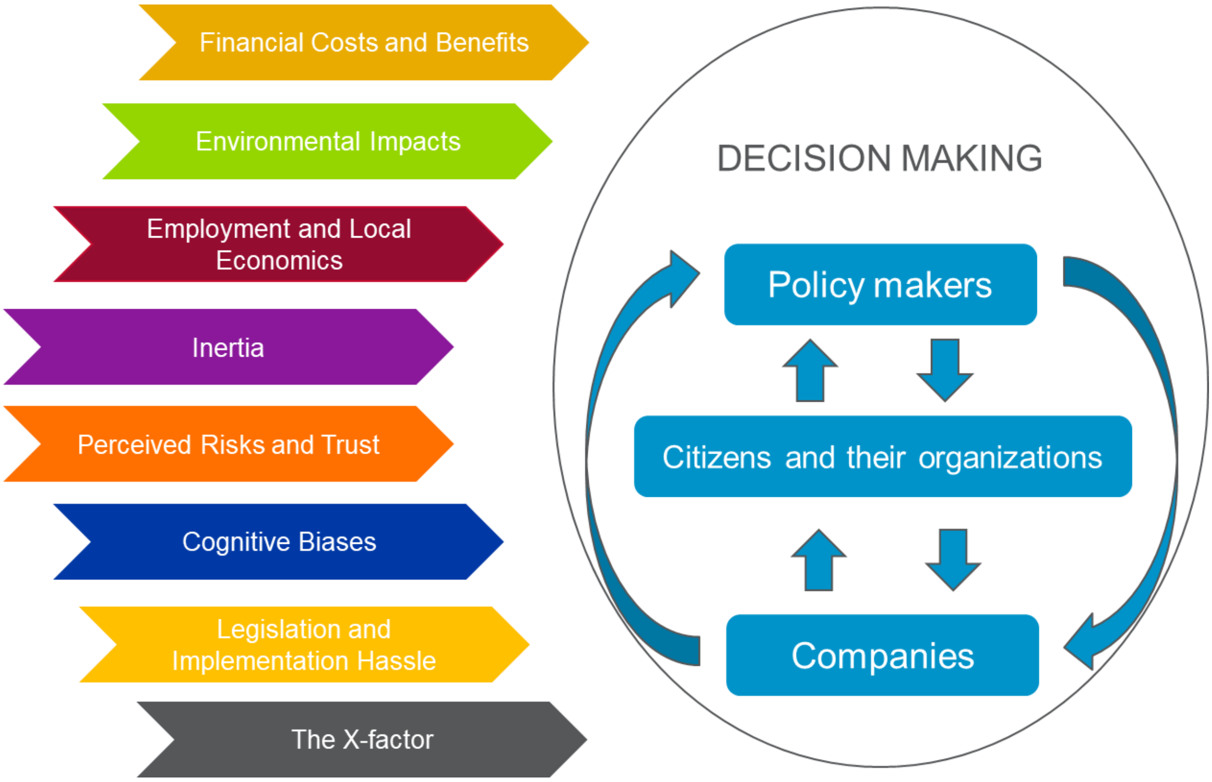
[3] Kornelis Blok and Evert Nieuwlaar, *Introduction to Energy Analysis* (Abington: Routledge, 2016), 279-289.

2 The socio-political merit order

This paper proposes that in developing energy strategies the least-cost optimisation is expanded to a set of new procedures that allow for a “socio-political merit order.” This merit order is about preferences: preferences of citizens, but more importantly——of policymakers and corporate decisions makers. People may prefer using certain energy carriers and might be inclined to buy electricity from a certain origin. Likewise, people may have preferences regarding electricity production, e.g., producing electricity themselves at a small scale rather than purchasing it from a large centralised facility, even if it is the same generation technology.

However, many decisions regarding energy are not made by individual citizens, but by policymakers—parliaments and governments. Here, too, there will be preferences. Similar to the choices and propensities at the individual level, the costs of the various energy options will play a role. Nonetheless, as the two statements above illustrate, policymakers also take into account other aspects in their decision-making (Figure 1).

Figure 1: Aspects determining the socio-political merit order



(Source: Ecofys, a Navigant Company)

These aspects may include, but are not limited to:

- ***Financial costs and benefits*.** Financial costs and benefits are calculated by virtually all energy and climate models. This is mostly limited to direct monetary costs and benefits. A critical point here are the discount rates used; social discount rates may deviate strongly from (implicit or explicit) discount rates applied by decision makers when evaluating a particular energy option or technology.

- ***Environmental impacts.*** Environmental impacts often serve as constraints within least-cost models. The simulation or optimisation algorithms are organised in such a way that certain environmental constraints are observed. However, it may be in the public interest to require a tighter playing field—in particular when it comes to pollutants with a strong local impact.

- ***Employment and local economics.*** Impacts on employment and on the distribution of economic activities are calculated by many models. While models are often not optimising for employment and local activity impacts, policymakers stress these as important factors when deciding about technologies.

- ***Inertia.*** There will always be some tendency to choose the known over the unknown. In other words: “things are working well now, so why should we change them?” Further, vested interests of influential parties can play a key role in resisting change.

- ***Perceived risks and trust.*** Risks associated with technology deployment can be calculated, or at least estimated. However, public perception of these risks may strongly deviate from the quantified analyses. Perceived risks are difficult to quantify and hence tough to model. Nevertheless, if there is single factor that determines the acceptability of technologies it is probably this one.

- ***Cognitive biases*.** While not taken directly into consideration by decision makers, they do strongly affect the outcome of decision-making. In the context of the socio-political merit order, one should think of anchoring, confirmation, bandwagon, risk aversion, and other less tangible drivers of decision-making.

- ***Legislation and implementation hassle.*** Inherently, the implementation of certain technologies is more cumbersome than others. For instance, it is easier to have PV system installed on one’s roof than to get one’s home insulated. The same is valid for the politicians, as illustrated in Andris Piebalgs’ statement above on the nitty-gritty of energy efficiency policy.

- ***Last, but not least, the X-factor.*** Certain technologies are perceived as more appealing than others, and not always for obvious reasons. The type of technology, its innovative character, and the scale of its application are some of the elements that play a role. More often than not, these technologies receive more public and even political support than those that miss such attributes—solar PV systems and EVs are good examples of technologies that people have an inherent appreciation for, perhaps because they are just both silent and powerful.

These aspects influence each other intensively, and collectively shape the preferences of both citizens and policymakers. Hence, the socio-political merit order is defined as a set of these societal and political preferences that are shaped by the total of the attributes described above.

This socio-political merit order should play a central role in developing energy and climate scenarios and in advancing energy and climate visions and strategies. The challenge lies in interpreting its individual components and determining the socio-political merit order correctly.

2.1 Determining the socio-political merit order

Energy options that rate high in the socio-political merit order may be defined as those that are most preferred or, alternatively, least disliked by society and by policymakers. Such are most likely to receive political support for implementation.

The socio-political merit order is dynamic. It will vary over time and it will differ from country to country, or even between regions in countries. Notably, perspectives in developing countries—with a lot of emphasis on primary needs and scarcities—can often be substantially diverging from those in developed countries.

How can the socio-political merit order be determined, then, along with the underlying factors that drive the merit order? For the time being there are seemingly three ways to do this:

- ***Surveys.*** The traditional approach is to survey the general public, politicians, corporate decision makers, etc. about their attitude towards a variety of given options and technologies. Various surveys regarding predilections for energy technologies have already been carried out, some discussed later in this paper. Surveys come in various forms, the simple ones identifying stated preferences, and others more interactive—providing information or searching for revealed inclinations.

- ***Dialogue processes.*** An alternative to surveys is the use of dialogue processes, where participants consider given choices in a concrete context. Participants can be provided with information on demand, and can interact with each other and other stakeholders. In 2015, Ecofys, a Navigant company, supported a dialogue process in the City of Utrecht, which wants to achieve energy neutrality by 2030. Participants included about 200 randomly selected citizens that agreed on an energy plan during 3 days of meetings. There was a general preference for solar energy as opposed to wind energy, although wind energy could make a significantly more cost-efficient contribution to reaching the objective. Those concerned about visual and noise impact were not in favour of wind energy. However, the participants were willing to discuss conditions that would make wind energy and other options acceptable, and agreed on decision processes to decide on this in particular cases. Similar, dialogue processes may also be carried out on a much larger scale within internet communities.

- ***Unstructured data.*** Unstructured internet data, e.g., social media, is an information source with tremendous potential that still is in an early stage of exploration. The reliability of such datasets raises some question marks, nevertheless their use has serious advantages. For instance, the surveyed population sample is much larger than in commonly used techniques, thus allowing for extended segmentation, the non-response problem is limited (although other biases may be introduced), and it is easier to track the development of preferences over time.

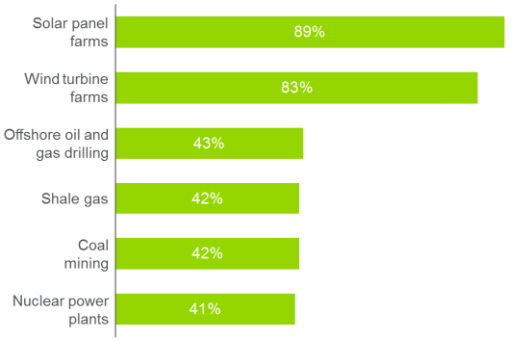
2.2 What is already known about the socio-political merit order?

Most of the currently available knowledge about inclinations towards certain energy technologies come from surveys of individual citizens. Most of these surveys covered preferences for energy supply options, as seen in Figure 2. Solar and wind energy are most often the winners, while coal and nuclear generally are the losers. Bio-energy is typically less popular than solar and wind. Energy efficiency was rarely treated in the surveys, but it still fared relatively well; the same cannot be said about carbon-capture and storage.

Figure 2: Preferences for energy technologies in a variety of countries and regions

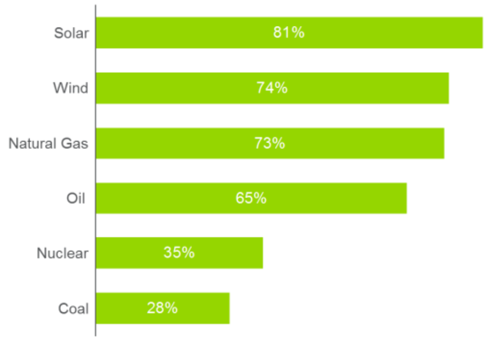
Public opinion on energy sources in the US[4]

Which energy sources should be expanded in the US?



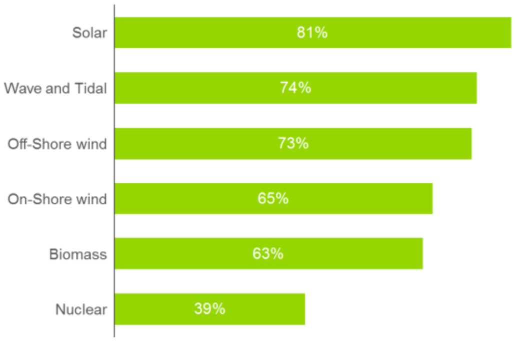
Public opinion on energy sources in the US[5]

Which energy sources should the US put more emphasis on as a country?



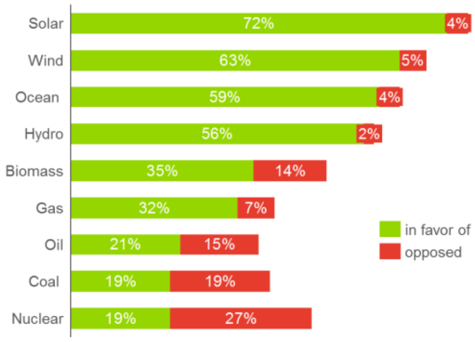
Public opinion on energy sources in the UK[6]

Which energy sources should be expanded in the UK?



Public opinion on the use of energy sources in the UK[7]

Are you in favour of or opposed to the use of these different energy sources in the UK?



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[4] Cary Funk and Brian Kennedy, *Public Opinion on Renewables and Other Energy Sources*, Pew Research Center, 2016.

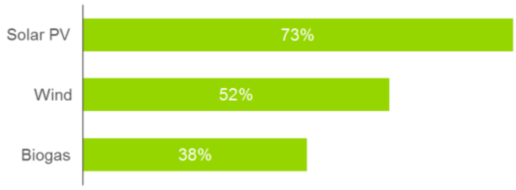
[5] Rebecca Riffkin, "US Support for Nuclear Energy at 51%," Gallup, http://news.gallup.com/poll/182180/support-nuclear-energy.aspx.

[6] Department of Energy and Climate Change, *DECC Public Attitudes Tracker – Wave 13*, 2015.

[7] European Commission, *Energy Technologies: Knowledge, Perception, Measures*, 2007.

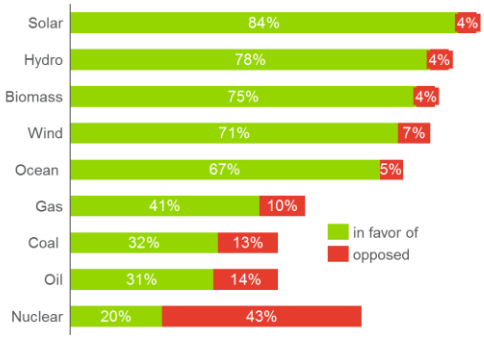
Public acceptance of renewable energy sources in Germany[8]

Are you in favour of expanding these renewable energy sources in your own neighbourhood?



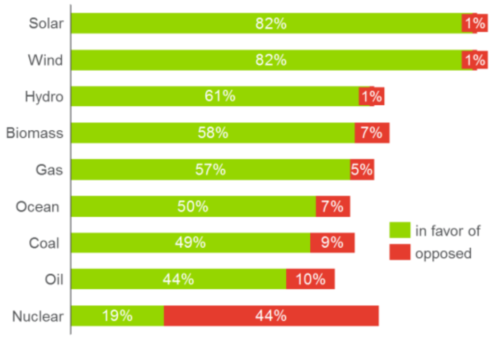
Public opinion on the use of energy sources in Germany[9]

Are you in favour of or opposed to the use of these different energy sources in Germany?



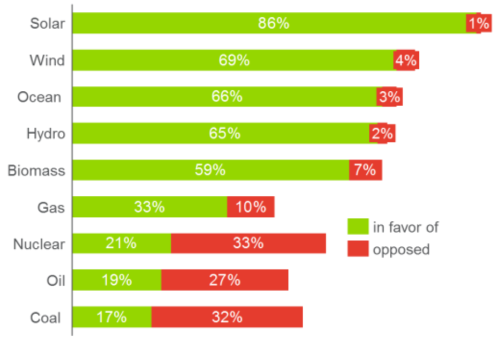
Public opinion on the use of energy sources in Poland[10]

Are you in favour of or opposed to the use of these different energy sources in Poland?



Public opinion on the use of energy sources in France[11]

Are you in favour of or opposed to the use of these different energy sources in France?



[8] Renewable Energies Agency, *Acceptance of Renewable Energy in Germany*, 2016.

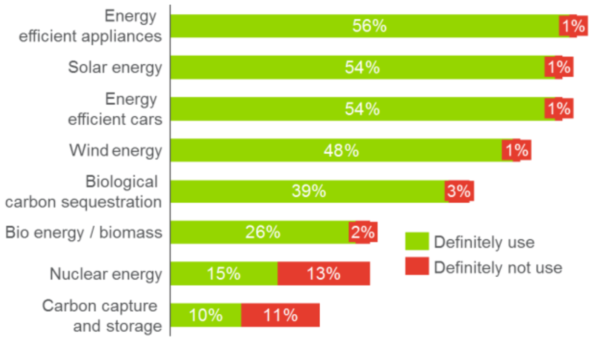
[9] European Commission, *Energy Technologies: Knowledge, Perception, Measures*, 2007.

[10] Ibid.

[11] Ibid.

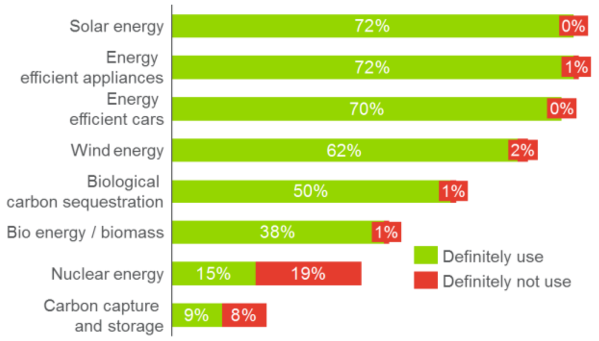
Public attitude towards climate change and how to address it (US perspective)[12]

Which energy technologies should/should not be used to address global warming?



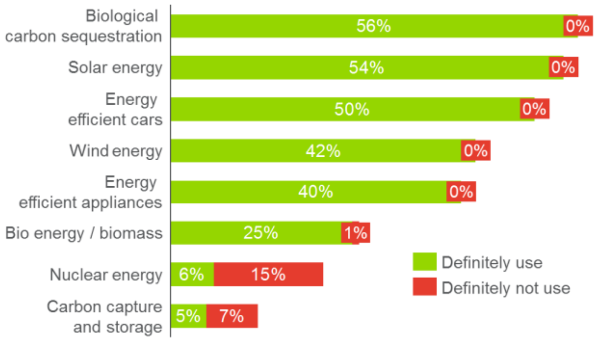
Public attitude towards climate change and how to address it (UK perspective)[13]

Which energy technologies should/should not be used to address global warming?



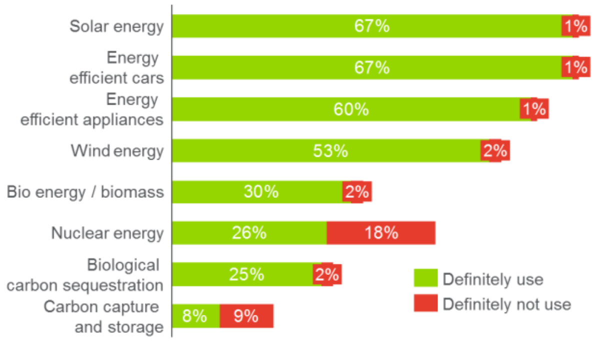
Public attitude towards climate change and how to address it (Japanese perspective)[14]

Are you in favour of expanding these renewable energy sources in your own neighbourhood?



Public attitude towards climate change and how to address it (Swedish perspective)[15]

Are you in favour or opposed to the use of these different source of energy (in your country)?



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[12] Rohan Fernando, *Public Attitudes to Biomass Cofiring*, IEA Clean Coal Centre, 2013.

[13] Ibid.

[14] Ibid.

[15] Ibid.

Source: Ecofys, a Navigant Company

Less information is available on preferences amongst policymakers. A study for the Netherlands[16] shows that there are hardly any unconditional supporters for carbon capture and storage in the Dutch parliament, which is in sharp contrast to solar and wind (reference David MacKay's quote, above). Policymaking is one of the arenas where social preferences are translated into action, i.e. by supporting one technology and discouraging another. The private sector presents yet another arena; there, decisions are not purely driven by cost-benefit analysis, but also by factors such as public acceptance, non-monetary implementation barriers, and regulatory risks. Of note, these are often already translated into financial metrics or constraints in the corporate environment.

2.3 Biases and the socio-political merit order

Cognitive biases will affect not only the overall socio-political merit order but also the perception of its aspects. Biases are well-described and understood in corporate decision-making, where they are increasingly anticipated and accounted for. However, in the political arena and amongst the general public, this awareness might be severely lacking. In this case, the aspects of the socio-political merit order are not treated based on pure logic, but rather perceived through lenses of personal preferences, attitudes, etc.

For example, anchoring bias, or an individual's reliance on the first information available, may result in a situation where an individual maintains that PV's energy ROI is negative, neglecting that the situation changed tremendously.

Collectively, these cognitive biases will be part of the explanation for the geographically varying preferences for different energy sources and abatement options as observed in Figure 2, and must be accounted for.

Public perception of different technology (amongst other things) is transient and can change quickly. A list of favoured technologies today could change overnight, making a particular technology look attractive (e.g., the rise of EVs following Tesla's excellent marketing) or a tragic event being associated with it (e.g., Grenfell Tower fire in the UK and the immediate dispute regarding external wall insulation). Understanding the reasons for people's sentiments is another key piece in this analysis.

[16] Sander van Egmond, *Unravelling the Contested Nature of Carbon Capture and Storage*, Utrecht University, 2016.

3 The prize: more robust energy visions and scenarios

In traditional technological assessments, economies of scale are considered and relative costs are compared. “Next to standalone least-cost modelling, and even when describing the socio-political merit order, descriptions of different future state scenarios should be utilized.”

Key drivers in those future scenarios are different acceptance rates of technologies as a result of the biases described previously, different speed of acceptance thorough critical mass (steeper cost decrease through larger demand), and tipping point assumptions (technology lock-in, or winner takes all economies).

Unavoidably, questions will remain about the socio-political merit order. Modelers and scenario developers will face the challenge of social preferences changing over time. A positive attitude towards a certain technology might abruptly change when it comes to implementation and when consequences of its deployment become visible. The opposite may also be true; people could be wary about new technologies, but this changes once they grow accustomed to them. There will also be discrepancies between various decision makers: individuals, companies, and policymakers all may have different preferences and biases.

Once there is clarity about individual and societal inclinations, the question will be how to represent these in energy and climate modelling. Converting non-monetary barriers and drivers into cost categories or letting them adjust financial variables is a tempting option that might just miss the point, as it suggests that technology choices are an optimisation problem. Policy makers may opt for the cost-optimal mix of technologies, but rather exhaust one technology first and then move on to the next. For this reason, the merit order is necessary. The technology options might be developed in parallel—but at a different pace or in a different policy or market context—which will influence the socio-political merit order. Consequently, not only is a different way of ranking options necessary, but also a different way of modelling.

The development of a completely unorthodox approach for building future energy visions and scenarios requires additional investigation. First, building more detailed knowledge of social preferences. Second, understanding how these preferences interact with the merit order of actual private and public decision-making. And third, utilizing the insights for better development of the energy vision.

Having said this, the concept of the socio-political merit order can be developed already today. Nothing prevents people from building on the limited knowledge that exists in the current scenario. More robust visions can be constructed that can withstand the pulls and pressures in the sometimes-harsh socio-political environments. This can lead to the creation of strategies that have broader citizen support and that can be implemented more rapidly.

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