

# An approach to sustainable-development-based energy and climate policies in India

Planning for India's energy future requires addressing multiple and simultaneous economic, social and environmental challenges. While there has been conceptual progress towards harnessing their synergies, there are limited methodologies available for operationalising a multiple objective framework for development and climate policy. We propose a 'multi-criteria decision analysis' (MCDA) approach to this problem, using illustrative examples from the building and cooking sectors

DOI 10.12910/EAI2016-017

by **Radhika Khosla**,<sup>a</sup> **Srihari Dukkipati**,<sup>b</sup> **Navroz K Dubash**,<sup>a</sup> **Ashok Sreenivas**,<sup>b</sup> **Brett Cohen** <sup>c</sup>

<sup>a</sup> Centre for Policy Research, New Delhi, <sup>b</sup> Prayas (Energy Group), Pune, <sup>c</sup> Energy Research Centre, University of Cape Town

India faces a challenging decade ahead in energy and climate policy-making. Problems are multiple: sputtering energy production capabilities; limited energy access; rising fuel imports; continued electricity governance and pricing challenges; and growing environmental contestation around land, water, and air. In addition, India's intended climate 'contribution' for the global climate negotiations will necessarily influence its domestic energy use, since energy accounts for 77% of

its greenhouse gas emissions (WRI 2014). India's energy future thus requires addressing multiple and simultaneous challenges, that together suggest great complexity.

So far, India's approach to energy policy-making has been largely supply-oriented and in silos, leading to a number of disconnects: between energy planning and social objectives, between domestic and foreign policy energy debates, and between energy and climate policy. Bridging these disconnects requires a shift in

the decision-making process to explicitly consider the linkages across India's multiple sustainable development objectives. This principle is already enshrined in the National Action Plan on Climate Change's "co-benefits" approach. However, while conceptually promising, the approach has not yet been backed by a methodology to operationalise it. In this brief, we introduce "Multi-Criteria Decision Analysis" or MCDA as a potentially useful way forward. MCDA presents a set of

well-established approaches for a range of decision-making arenas, and can be deeply salient to Indian energy policy because it allows decision-making to account for complexities, while maintaining rigor and deliberation. In presenting an MCDA approach, we build on other efforts to operationalize multiple objective approaches to Indian energy decisions. These include an early framework for multi-criteria analysis (Dubash et al. 2013), energy dashboards (Sreenivas and Iyer 2015; SSEF 2015), and state and sectoral analyses (Jain et al. 2015; GGGI 2014).

The remainder of the brief describes the essence of an MCDA approach and lays out its benefits, details and applications. The approach is applied illustratively to two case studies: access to modern cooking fuels and building energy efficiency. We present key insights from the two cases in the following sections.

### Operationalizing an MCDA Approach

The synergies between sustainable development and climate consider-

ations are of growing significance. While some national studies track *ex post* achievement of these sustainable development objectives, the primary challenge is to move beyond an illustration of their potential towards a methodology that allows an *ex ante* focus during policy-making.

Four broad sustainable development objectives comprise the common set of social preferences that cut across decision-making within an energy policy context. These are economic, social, environmental and institutional objectives which should ideally be served simultaneously. Within this context, we apply the MCDA approach illustratively to two sectors, cooking and building. The cooking sector is important because over 700 million people in India do not have access to modern cooking fuels and the adverse health effects of traditional, open-stove cooking result in an estimated one million premature deaths annually (Census 2011; Smith et al. 2014). Selecting effective policies to provide modern cooking fuels for rural households is therefore a development imperative.

Buildings, on the other hand, rep-

resent India's rapid urban transformation, and it is expected that two-thirds of the buildings stock to exist in 2030 is yet to be built (Kumar et al. 2010). Building energy efficiency policies offer benefits that go beyond energy savings, such as carbon mitigation, energy security, job creation, and increased socio-environmental outcomes. However, if unaddressed, the sector could lock India into a high-carbon growth path. We focus on evaluating energy efficiency policy options for new building envelopes in the residential sector, where most new construction is expected.

We analyze both sectors using an MCDA approach and discuss its advantages for decision-making in the following section. The input data for the case studies, and part of the methodology in the buildings case, draws on NITI Aayog's Indian Energy Security Scenarios, a bottom-up energy accounting model.<sup>i</sup> The MCDA approach results are presented graphically in the "spider diagrams" in Figure 1 and 2. The larger the area of a spider, the better the policy alternative will be at fulfilling

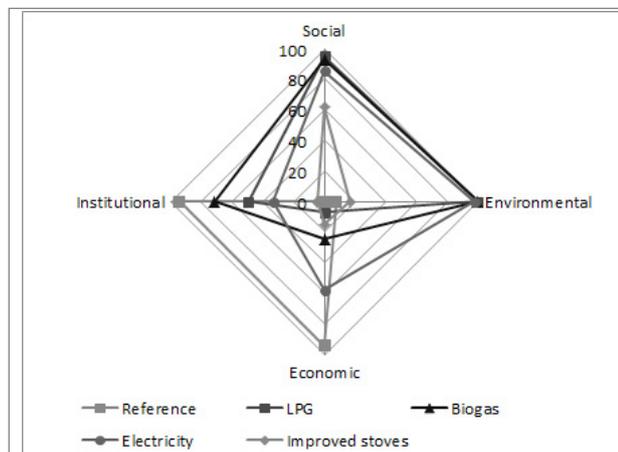


Fig. 1 Cooking spider

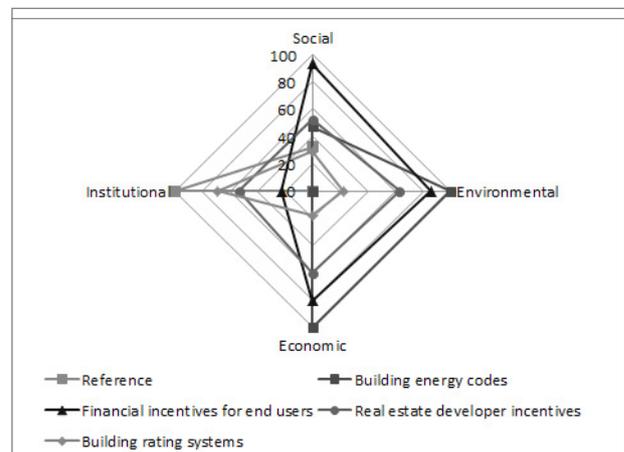


Fig. 2 Buildings spider

multiple objectives. These outcomes are illustrative, because they are preliminary and are not fully based on stakeholder consultations beyond expert input.

### Insights for Policy

An MCDA approach provides important benefits: a structure for addressing multiple objectives simultaneously, a means to account for information that is not easy to quantify (such as distributional questions), and a rigorous consideration of choices involving synergies and tradeoffs when there are different stakeholder opinions on policy priorities. Examples from the two cases

help demonstrate these benefits. First, the approach requires policy-makers to explicitly state the policy objectives to be achieved, and the weight given to each objective. For example, in the cooking case, the economic, social, environmental and institutional objectives are explicitly laid out at the start of decision-making. Figure 3 shows the policy question with its explicit objectives and their translation to specific metrics or criteria, against which different policy options can be evaluated. This approach encourages consideration of factors that are often ignored, such as household drudgery. Further, the approach requires identifying the relative weight given

to each objective, such as minimizing household air pollution versus reducing greenhouse gas emissions. This attention enhances the transparency of process, and the effectiveness of the final decision. Second, MCDA offers a range of tools for incorporating both quantitative and qualitative information with equal rigor. Importantly, the approach allows the use of qualitative information, for example, the consideration of implementation obstacles, which are often hard to analyze but nonetheless crucial to consider. In the buildings case, institutional questions are explicitly considered as a combination of *ex ante* implementation challenges, such as interests

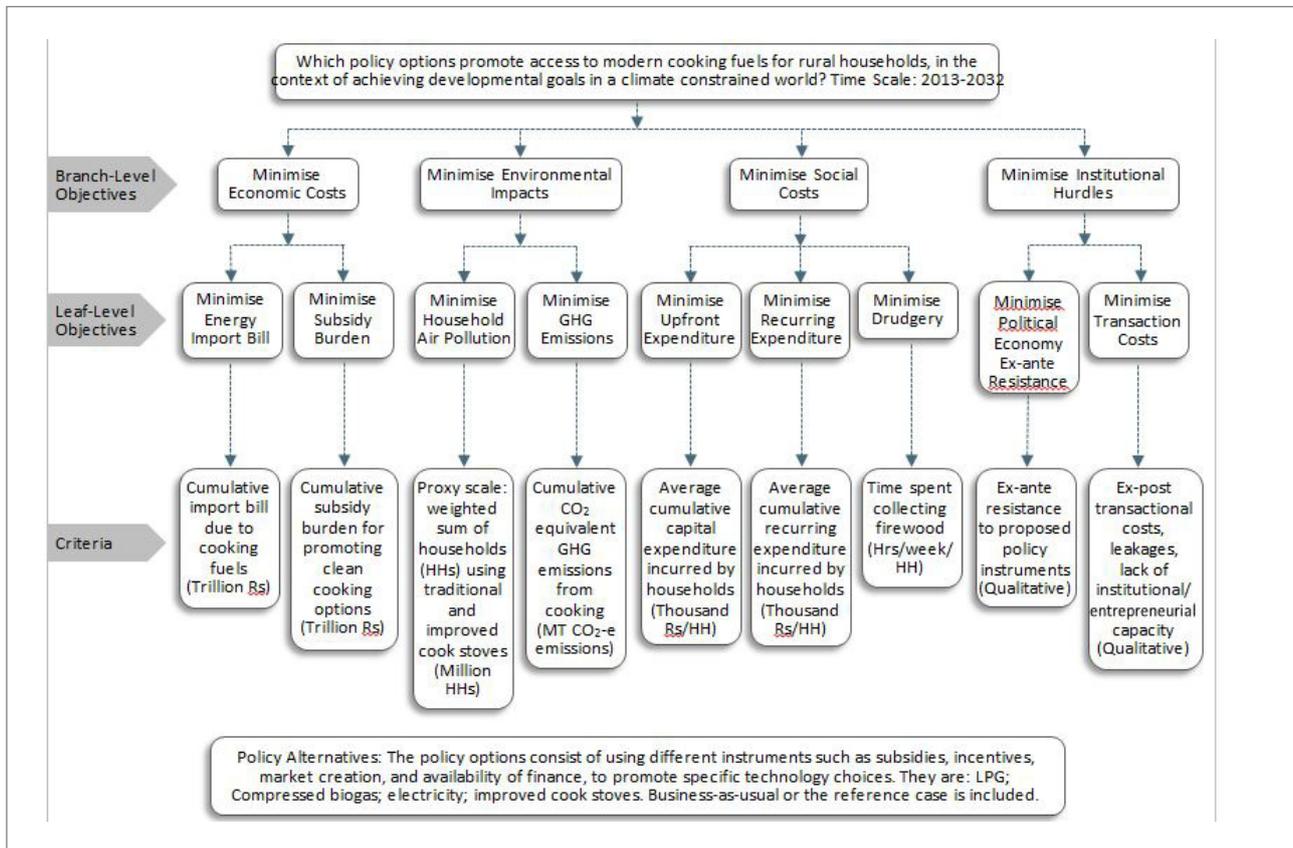


Fig. 3 Multiple objectives and policy alternatives for the cooking sector study

for or against a policy, and *ex post* elements such as the availability of required capacity or skills. As Figure 2 demonstrates, by including qualitative analysis on implementation, the results shift considerably - the building energy code policy that fares best on environmental, social and eco-

broadening of the information base beyond expert analysis to include relevant stakeholders likely adds to the complexity of the process, but certainly enhances buy-in and enriches the analytical base. Last, the process of deliberation and repeated iteration involving a wide

could either lead to clear winners or losers amongst the alternatives being considered. Or, it could facilitate further deliberation on the tradeoffs, and ways to improve the policy alternatives (by piecing together components that do well on many objectives, if possible) to fur-

### Key Steps of a MCDA Approach

*Step 1: Define the problem.* Identifies the policy question's scope and time horizon by bringing all stakeholders on board at the start.

*Step 2: Identify policy objectives and specific metrics for assessment.* Requires a clear understanding of national priorities thereby allowing for a greater range of alternatives to be considered.

*Step 3: Identify policy alternatives to evaluate.* Requires consideration of

alternative policy approaches and an identification of the metrics for success.

*Step 4: Analyze the alternatives.* Identifies data gaps and provides a transparent basis for discussions.

*Step 5: Elicit stakeholder preferences and normalize quantitative and qualitative information.* Allows qualitative information to be equally integrated with quantitatively determined objectives.

*Step 6: Aggregate through weights*

*and compare consequences.* Captures the interactive effects across policy objectives and the relative importance of the criteria.

*Step 7: Uncertainty and sensitivity analysis.* Tests the robustness of the inputs and the process by identifying any inordinate changes to the results from changing assumptions.

*Step 8: Choose the preferred policy alternative.* Implement the preferred alternative and evaluate results to feed back into the policymaking process.

nomic fronts, scores worst on ease of implementation. It thereby brings the attention of policy-makers to the institutional trade-offs of this policy option.

Third, given the careful consideration of qualitative information and subjective weighting of objectives, MCDA approaches are necessarily underpinned by an early involvement of stakeholders. These include technical experts, policy-makers, industry, end-users and civil society. For example, in the cooking case, to assess the relative importance of limiting drudgery versus other objectives, it is important to understand the preferences of the target cook stove users themselves. This

range of stakeholders improves the sectoral knowledge base. The approach demands an identification of key issues, addition of information and refinement of argument and scores, all of which help plug data gaps to create a robust energy and sustainable development data spine. The buildings example is a case in point, as answering the policy problem requires researching data varying from the upfront investment needed for efficiency, to the local pollution reduced from lower diesel generator use.

Approaching a policy problem in this manner sheds light on the complementarities and tradeoffs between different objectives, which

ther minimize tradeoffs and identify better policy options.

### Conclusion

Development policy-making, which incorporates energy and climate considerations, is a complex undertaking. It involves multiple objectives and various actors operating at different levels of governance. The MCDA approach proposed offers a useful way to work within this complexity, and facilitates a sustainable development approach to energy and climate policy-making. MCDA is particularly suitable in the climate context as it allows policy-makers to place rela-

tive weights on economic and social development objectives, compared to climate objectives, consistent with India's co-benefits based approach to climate policy. Moreover, it allows transparent assessment of complementarities and tradeoffs across development and climate objectives. While this brief is focused on mitigation, an MCDA approach can be used for a wide range of applications, including adaptation, as well as for other questions of social policy. In the immediate term, using the approach would strengthen coherence between India's domestic and international position on climate change, which rests on the principle of not compromising development needs. Further, it can be employed to distinguish between additional climate actions that India could undertake with external aid which fall outside the scope of co-benefits. In the longer term, it can be used for opportune plan-

ning purposes that are already in progress, such as India's National Energy Policy, or sectoral feasibility of India's climate commitments. Ultimately this approach, underpinned by active deliberation, gives rise to decision processes that are participative, transparent and repeatable. Recognizing that MCDA approaches can be time and resource intensive, they are proposed as a starting point for more structured and inclusive policy-making – to allow for India's energy and climate actions to be compatible with its broader social, economic and environmental goals.

#### Acknowledgement

This article is an updated reproduction of a policy brief of the Centre for Policy Research (CPR) available at: <http://www.cprindia.org/research/reports/approach-sustainable-development-based-energy-and-climate-policy>. It was produced

in partnership with the Energy Research Centre, and the Prayas (Energy Group) as part of a larger project: Towards a Robust Development Focused INDC, funded by the Climate and Development Knowledge Network (CDKN). CDKN is a programme funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. The views expressed and information contained in it are not necessarily those of or endorsed by DFID, DGIS or the entities managing the delivery of CDKN, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them. We are also grateful for additional financial support from the Oak Foundation. All responsibility for analysis and views expressed in this report rests with the authors.

<sup>1</sup> Our calculations use a draft version of IESS version 2, made available to us for this analysis. Version 2 of the IESS is now available at [indiaenergy.gov.in](http://indiaenergy.gov.in)

## REFERENCES

- Census. 2011. Households By Availability Of Separate Kitchen And Type Of Fuel Used For Cooking. New Delhi: Government of India. Available at <http://www.censusindia.gov.in/2011census/Hlo-series/HH10.html>.
- Dubash, Navroz K., D Raghunandan, Girish Sant, and Ashok Sreenivas. 2013. "Indian Climate Change Policy- Exploring a Co-Benefits Approach." *Economic and Political Weekly XLVIII* (22): 47-61.
- GGGI. 2014. Green Growth Strategy for Karnataka. Seoul: Global Green Growth Institute.
- Jain, Abhishek, Poulami Choudhary, and Karthik Ganesan. 2015. Clean, Affordable and Sustainable Cooking Energy for India - Possibilities and Realities beyond LPG. New Delhi: Council on Energy, Environment and Water.
- Kumar, Satish, Ravi Kapoor, Rajan Rawal, Sanjay Seth, and Archana Walia. 2010. Developing an Energy Conservation Building Code Implementation Strategy in India. New Delhi: USAID India.
- SSEF (Shakti Sustainable Energy Foundation). 2015. An Energy Security Index for India. New Delhi: SSEF (forthcoming).
- Smith, Kirk R, Nigel Bruce, Kalpana Balakrishnan, Heather Adair-Rohani, John Balmes, Zoë Chafe, Mukesh Dherani, H. Dean Hosgood, Sumi Mehta, Daniel Pope, Eva Rehfuss. 2014. "Millions Dead: How Do We Know and What Does It Mean? Methods Used in the Comparative Risk Assessment of Household Air Pollution." *Annual Review of Public Health*: Volume 35: 185-206.
- Sreenivas, Ashok, and Rakesh K Iyer. 2015. "A 'Dashboard' for the Indian Energy Sector". *Economic and Political Weekly L* (11): 13-16.
- World Resources Institute (WRI). 2014. Climate Analysis Indicators Tool (CAIT). WRI's Climate Data Explorer. Washington DC: World Resources Institute. Available at <http://cait2.wri.org/wri>