Circular economy

Trust the models?

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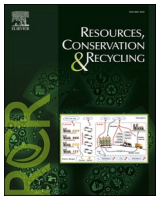

Perspective

Circular economy: Trust the models?

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1. Introduction

Policy models based on 'big data' and other 'smart' systems, including those for circular economy (CE) transition, are proliferating as technology enables deeper monitoring and analysis. At the same time, policymaking is occurring in increasingly contentious and politically fragmented settings, particularly as populism foregrounds anti-science and post-truth sentiments. More sophisticated models would appear to improve empirical understandings about policy problems and help resolve associated disputes, but a conclusive policy 'truth' remains elusive and politically contestable. This contention highlights the need to understand competing narratives and their influence on model designs and inputs.

The political dynamics of modeling are increasingly relevant to circular economy (CE) transitions. There is a plethora of advanced and emerging methods in the CE modeling field. Examples are material flow analysis, product life cycle assessments, and projections about the broader impacts of circular transition (e.g., macroeconomic and equilibrium models; McCarthy et al., 2018). Such models are promoted as a basis for major policy decisions and resource appropriations. Further, there is increasing overlap in inputs and conceptual structures between national and global modeling efforts – particularly those adopting a much-needed macro-level and systemic perspective. However, many such models remain at the early stages of development. Therefore, it is prudent to consider their validity before the outputs become too deeply institutionalized and taken for granted.

Modeling outputs are shaped not only by data but also by structural design and related decision systems – e.g., what is included and excluded, how variables are weighted, and the certainty with which outputs are interpreted and applied. While the CE literature has focused primarily on industry-level practices, their mechanics, and policy options to facilitate transition, the politics and visioning around how CE is modeled deserve renewed attention in the current era of systemic disruption and political volatility.

2. Modeling meets politics

Aligning policy efforts to promote CE transition begins with imagining circular futures (see Bauwens et al., 2020) – an exercise as much a political as technical. If adopting traditional policy-analytical methods, CE modeling runs the risk of embracing a 'circular modernism' that considers only what it can measure, cherry-picks inputs, and presents itself as an objective exercise unencumbered by politics. A wider evidentiary base can help arrest this 'technocratic' (i.e., expert-informed and top-down) cycle. The way society imagines circular futures should include modeling as only one among multiple ways of constructing knowledge and shared understandings.

Based on our years of research in the CE policy field, we have found that policymakers typically place high trust in the objectivity of CE models and that, in the Netherlands for example, CE policymaking relies substantially on such models. These models are trusted by governments to provide valid and defensible quantitative grounds for policy decisions

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about what is an often highly technical topic. Further, few elected officials possess the technical expertise to understand all that CE transition requires, so gaps in expertise are filled by consultants, industry representatives, government staff researchers, and other experts.

Despite the seeming credibility of expert knowledge sources, the cloak of modeling objectivity can obscure underlying political interests, and a model itself should be seen as a mechanism that potentially enables and reinforces privileged narratives. Despite a long history of technocratic perspectives in formal policy analysis, the empirical precision and apparent certainty of models (along with the narratives they support) are being politically challenged, particularly as populist political leaders incite hostility and skepticism against scientists and experts.

We support the exercise of modeling and recognize that evidence and scientific facts are essential inputs into policymaking – from circularity to pandemics. However, given the noisy political context of modern policymaking, positivism (i.e., an exclusively scientific, evidentiary, or objective view of reality) should take a humbler posture, thus protecting space for the emergence of alternative policy narratives. The latter are not based on modeling alone but can enhance the political acceptability of modeling by elevating the role of co-produced knowledge. This humbler positivism also leads consumers of CE modeling outputs to consider the assumptions and structures supporting models, including the validity of data and model settings.

3. Towards a more pluralistic modeling

As Kuecker and Hartley (2020) argue, powerful interests can shape policy agendas by invoking the credibility of scientists, experts, and technocratic 'knowledge-creators' (p. 521). In a contested policy field, numerous interests jostle to influence the dominant policy narrative, especially for an issue as crucial to human wellbeing as the sustainability-economy interface. This influence is a privilege granted typically to those holding the most advanced technical capabilities and qualifications; in halls of government, modelers often win the debate. Currently, their perspective is largely sanguine about the virtues of CE transition but often produces model outputs that under-estimate negative impacts (e.g., social dimensions; Repp et al., 2021) and over-estimate technology-based productivity growth (McCarthy et al., 2018).

In cases like these, modeling serves the need for political leaders to appear evidence-based and impartial. The preference for rationalist, pragmatist, and science-driven approaches valorizes the perspectives of engineers, economists, and technocrats. For example, China's emphasis on 'test beds,' policy experimentation (e.g., Special Economic Zones and Eco-Industrial Parks), and monitoring and data collection are manifestations of a technocratic epistemic that takes policy analysis to be quantitatively reduceable. As such, naming and framing CE policy solutions can perpetuate a dominant narrative that defends the *status-quo* while diluting and co-opting marginalized interests and perspectives.

These circumstances highlight the need to embrace stakeholder inputs in their multitudes. Recent scholarship in public policy and administration suggests that such modeling should be more participatory than technocratic. Subjective knowledge offered by a diversity of stakeholders can play an important role alongside technical facts and data-informed analysis. For example, this knowledge can take the form of qualitative input from community-based NGOs and organized groups in locations where industrial production is concentrated. This knowledge can also include so-called folk, local, or indigenous wisdom concerning ecological conditions and adaptation to unexpected shock events. The pursuit of non-technical knowledge in policymaking has long been recognized in policy sciences theory, including Harold Lasswell's concept of pragmatism. Denying or obscuring perspectives that supplement or even challenge technocratic narratives, if only for the sake of modeling simplicity, undermines the democratic process.

Modeling proceeds from preferred policy visions, but these visions are not always democratically formulated and the specification of progress gaps can overlook subjective issues that elude technical measurement. The formality of modeling, projecting, and forecasting can hide or legitimize technocratic narratives and biases, privileging some policy perspectives while marginalizing others. The concurrent realities of increasing environmental stress and rising political contention mandate that CE policy approaches reinforce their own efforts to be democratic, responsive, and legible to the public.

4. Practical ways forward

To ensure a more participatory CE policy approach, the modeling process must be transparent and enhance public buy-in and political legitimacy. Many aspects of CE models are highly technical and it is therefore incumbent on policymakers, policy analysts, and government communications professionals to express model mechanics in ways that are intelligible to public audiences. Further, outputs of models based on differing assumptions should be presented in interim phases of policy optioning. A single and predetermined 'answer' should not be the first and only information to which the public has access. Participation is more meaningful than *ex-post* consultation.

The way forward, therefore, is foremost through transparency about how models operate and how outputs are generated and used. This approach requires not only the institutionalization of 'open' data and consultative or participatory processes, but also the 'translation' of technical activities in ways the public can understand. Furthermore, approaches like crowd-sourcing of data provide a way for the public to take ownership of the modeling process, thereby enhancing its legitimacy and ensuring a form of democratic check-and-balance. Taking a more idealistic tone, society must find an equilibrium between trust in science and a healthy skepticism of technocracy. In the current politically turbulent era, however, the prospects for this balance are uncertain.

From an academic perspective, further research is needed about the intersection of truth, public trust, and political credibility as they relate to CE modeling. While scholarship has room to develop regarding the technical precision of modeling, the translation of modeling outputs into policy realities must recognize the complexity of context. As suggested by Leipold et al. (2021), an alternative approach calls for the continued reimagining of science and technology studies as an interdisciplinary field accounting for social and political dynamics. This approach calls for open-mindedness not only in the realm of practice but also in the academy – particularly in scientific disciplines that have heavily influenced the development of CE modeling.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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