POLICY BRIEF

DEMAND-SIDE SOLUTIONS FOR TENSIONS IN TRANSITIONS

A synthesis of the four awarded papers and the dedicated Special Session debate at International Sustainability Transitions IST'25 Conference in Lisbon 24-26 June 2025.

OCTOBER 2025

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EDITS Energy Demand changes Induced by Technological and Social innovations
IST'25 Tensions and Trade-Offs in Structural Changes for Sustainability Transitions

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A synthesis of the four awarded papers[1] and the dedicated Special Session debate at International Sustainability Transitions IST'25 Conference in Lisbon 24-26 June 2025.

Citation: Bento N. (2025). Demand-Side Solutions for Tensions in Transitions, Policy Brief, October, DINÂMIA'CET-Iscte, 11p. 10.15847/dinamiacet-iul.pb.2025.01

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[1] Boza-Kiss B., 'Mapping Low Energy-Demand Policies for Deep Transformation of Buildings for Climate and Social Mitigation.'

Wilson C., Nemet G., Stercke S.d., and Zimm C., 'Diffusing Fast and Slow: Quantifying the Adoption Dynamics of Social Innovations.'

Guerineau M., Mayer J.C., Pedehour P., and Poinet L., 'The Social Fabric of Sufficiency: Exploring Acceptability of Energy Sufficiency Policies in France.'

Kumar P., Barbrook-Johnson P., and Wilson C., 'Tensions in Digitalised Daily Life: From Adoption Drivers to Rebound.'

Honorable Mention:

Krisch A., Lampl C., Schmidt A., and Aigner E., 'Interweaving Systems, Embedding Practices: Multi-System Practice Constellations in Just Sustainability Transitions.'

Sieed J., 'Analysis of Decarbonization of the Power Sector by Deploying Electric Vehicles at Scale, Coupled with Vehicle-to-Grid (V2G) Integration to Support Grid Flexibility and Stability: Japan Case Study.'

At-a-glance

30	Average number of years technological and social innovations take to grow from 10% to 90% market share. *Counters the idea that social innovations are inherently "slow," supporting balanced portfolios that scale both technology and social levers. Source: Nemet et al. 2025.*
12%	Respondents already heat their homes to a maximum of 19°C. *Integration of more frugal and sufficient practice in the daily routines increase the level of individual acceptance of sufficiency measures. Source: Guérineau et al., 2025.*
3	Groups of determinants of digital acceptance and continuance use. *Drivers influencing digital adoption and rebound operate across the individual, technological and meso-societal-system levels. Source: Kumar et al., 2025.*
One in Four	Low-income tenants in Austria and Hungary spends over 40% of income in housing. *Housing cost overburden is a major problem especially for poor households, in times of highly volatile housing and energy prices. Source: Boza-Kiss, 2025.*
540	Number of participants in the IST'25. *Very participated conference from 40 countries reflecting a mature, global epistemic community.*

From Sustainability Transitions Tensions to Demand-Side Solutions

Are transitions accelerating? The majority of **countries** raised the renewable share on final energy since 2010, but this is not the case when considering their share in consumption in petajoules (PJ), particularly if the U.S., China, and India are included (Figure 1). This highlights an important geopolitical tension in the current sustainability transition.

Sustainability transition speed must be paired with justice. Global fossil CO_2 was ~37.0 ± 2 Gt in 2023 and projected ~0.8% higher in 2024. Since 1800, the economy rose ~100×, energy ~50×, CO_2 ~30×, alongside ~1.5 °C warming and ~8 million premature deaths annually from air pollution—underscoring the unequal impacts of this "Great Acceleration."[2]

Amid recent climate backlashes, geopolitical frictions, and policy instability, debates converged in three anchors for keeping transitions on course: credible governance, equity as a strategy, and systemic leadership mobilizing coalitions.[3] These frame opportunities amid disruption—deploy tools, mobilize publics, widen coalitions. Four tensions emerge: **trade-offs (speed–scale–scope), resistance, technological lock-in**, and **equity**. Demand-side solutions can ease these pressures, and the four EDITS Awarded papers already advance some responses that inform policy toward impact.

[2] Nakicenovic's keynote and numbers from Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: the great acceleration. The anthropocene review, 2(1), 81-98.

[3] Conclusions from the plenary debate with Ana Fontoura Gouveia, Diana Ürge-Vorsatz, and Frank Geels.

Figure 1.
Increase of the share of renewable energies in total final energy consumption in 51 countries representing three-fourths of the global final energy consumption. Source: IEA, World Energy Balances Highlights, IEA, Paris https://www.iea.org/data-and-statistics/data-product/world-energy-balances-highlights

1) Responses to Trade-Offs (Speed–Scale–Scope)

Transitions juggle how fast change happens, how big it becomes, and how broad it reaches across sectors and behaviors.[4] Nemet et al. (2025) compare diffusion dynamics and show that **social innovations (new practices, norms, and services) can exhibit growth profiles broadly comparable to technological innovations,** especially once early coordination problems in the formative period are solved and learning effects kick in (Figure 2). This matters for policy design: if behavior- and service-led measures can scale with similar S-curve characteristics, then portfolios that balance hardware (e.g., heat pumps) with “software” (e.g., shared mobility norms) can relieve bottlenecks in skills, materials, and capital while still delivering system-level impact. Electric vehicles deployment is a good example of a technology innovation that can pair with behavior change (through vehicle-to-grid (V2G) technologies) to enhance grid flexibility and stability (Sieed, 2025).

[4] Andersen, A. D., Geels, F. W., Coenen, L., Hanson, J., Korsnes, M., Linnerud, K., Makitie T., Nordholm A., Ryghaug M., Skjolsvold T., Steen M., & Wiebe, K. (2023). Faster, broader, and deeper! Suggested directions for research on net-zero transitions. Oxford Open Energy, 2, oiad007.

The debate's call for "systemic leadership" and "disruptive granularity"[5]: governments and coalitions should orchestrate many small, modular interventions that compound quickly—rather than over-rely on a few mega-projects that risk delay. In short, the papers suggest the speed–scale trade-off is not purely technological; social diffusion can be a co-equal lever to reach scope and this should be similarly recognized in qualitative and quantitative analysis.

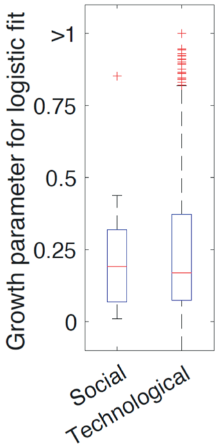

Figure 2.
Comparison of logistic growth parameters for social innovations and technological innovations. Technological and social innovations display almost the same distribution, the former having a marginally higher median (0.150) than the latter (0.147), corresponding to roughly 30 years in both cases. Source: Nemet et al., 2025.

2) Resistance (social acceptance & political feasibility)

Sociotechnical research has long shown that social aspects are as important as technological elements in sustainability transitions.[6] Guérineau et al. (2025) demonstrate that **policy design features strongly shape the acceptability of sufficiency measures.** Fairer policies, inspired on governed sufficiency (through participatory developed rules of use and allocation) are more accepted, while symbiotic sufficiency more disruptive of the lifestyles faces more contestation, especially in food and digital use sectors (Table 1). In addition, individual experience with sufficiency measures increases acceptance. Kumar et al. (2025) reinforce that acceptance hinges on mental models: households weigh utility, privacy, and effort; when interventions are legible and low-friction, adoption and sustained use improve. The debates emphasized that people accept constraints more readily when benefits are visible and fairly

[5] See also Wilson, C., Grubler, A., Bento, N., Healey, S., De Stercke, S., & Zimm, C. (2020). Granular technologies to accelerate decarbonization. *Science*, *368*(6486), 36-39.

[6] Geels, F. W. (2024). Advanced Introduction to Sustainability Transitions. Edward Elgar Publishing.

distributed, and when institutions are trustworthy. This provides indications on how policies should be implemented: pair voluntary “on-ramps” (trials, opt-ins) with well-timed standards; bundle measures with tangible co-benefits (comfort retrofits + bills support); and invest in credible monitoring so promised gains show up on time and in people’s bills and homes—turning resistance into readiness.

Sufficiency Types	Mean Values	Sectors	Mean Values
Monitored	0.0601	Comfort	0
Symbiotic	-0.3053	Food	-0.3073
Governed	0.2452	Mobility and transports	0.2695
		Consumption	0.1339
		Digital use	-0.25

Table 1.
Types of sufficiency measures and sectors that increase acceptance – mean values of items from statements of respondents on each categories. Source: Guérineau et al, 2025.

3) Technological lock-ins (digital dependence, heterogeneity & rebound)

Kumar et al. (2025) map household mental models of digital adoption and continuance, showing how trust, voluntariness, and user heterogeneity can shape rebound over time. Two broad profiles emerge: Type 1 (enthusiastic) experience digitalisation as agency-enabling, while Type 2 (reluctant) report lower perceived control and greater risk. Users often rely on proxies such as privacy cynicism to override concerns, which sustains adoption but can entrench dependence. Low voluntariness reinforces continuance through digital lock-in, even when satisfaction is low. These feedbacks create conditions where cost- and time-saving applications trigger rebound, as savings are reinvested in additional digital services or energy use. **With digital lock-in and shifting loop dominance shaping long-run demand, policy must go beyond mere efficiency claims.** It is imperative to track rebound empirically, ensure discontinuance options, and recognise that it is possible for excessive societal dependence on the digital to erode user agency as well as climate benefits.

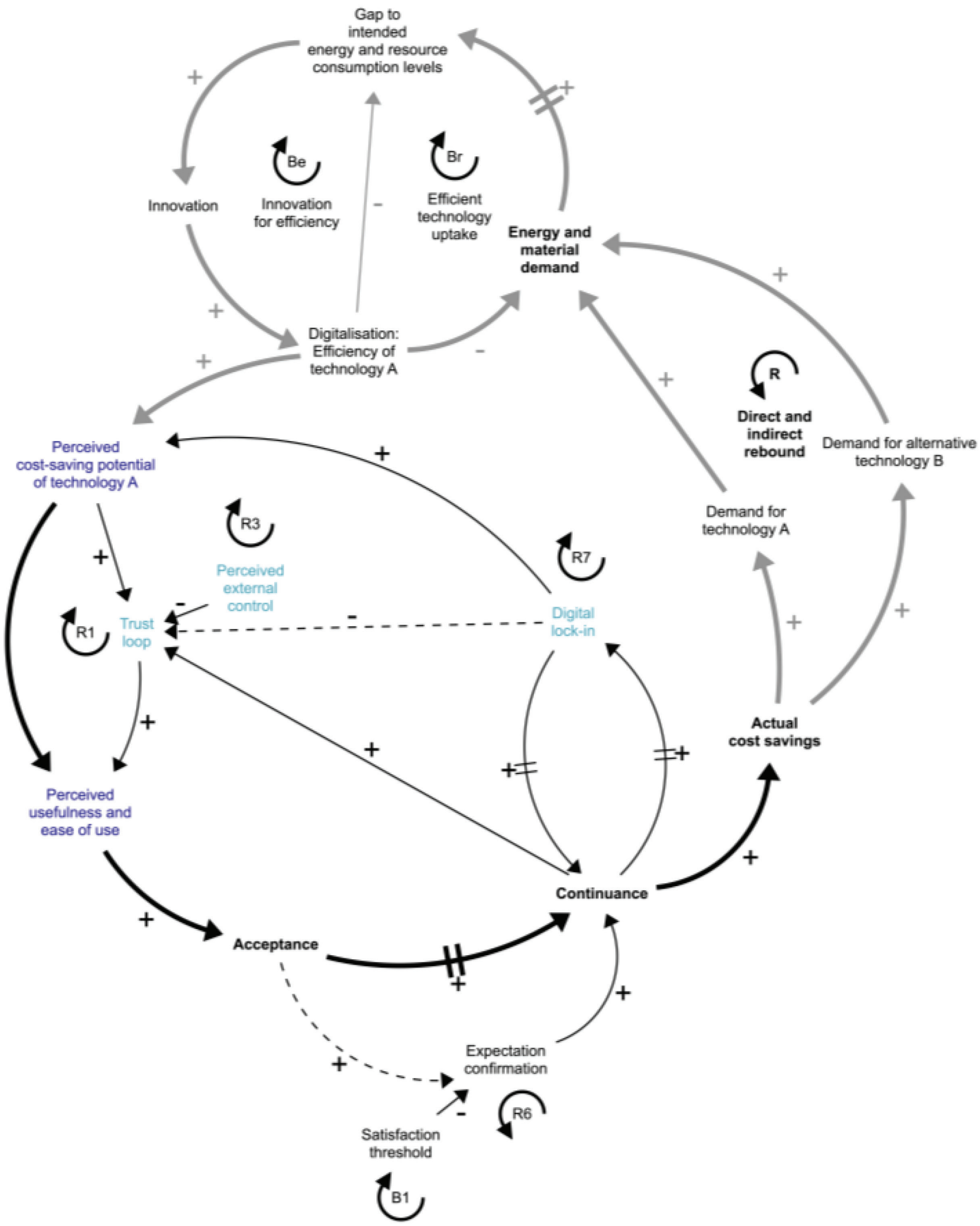

Figure 3.
Individual and societal determinants of digital technology use and rebounds. Simplified representation.
Source: Kumar et al., 2025.

4) Equity (access, capability & durable impact)

Boza-Kiss (2025) shows that one-stop-shops (OSS) for building retrofits and services can increase awareness, while lower search and transaction costs, particularly for low-income and poor households. When OSS models integrate assessment, financing, implementation, and aftercare, they improve access and completion rates, translating into more durable efficiency and comfort gains. Guérineau et al. (2025) complement this result by showing that acceptance rises when people can see themselves in the policy—eligibility clarity, hassle-free processes, and visible local benefits. But the access inequality does not concern affordable housing and thermal comfort alone; it also includes access to essential services such as public transport and nutritious food (Krisch et al., 2025). The equity aspect resorted as strategic in the debates: without equitable access, transitions face more social resistance and under-deliver technically; with it, they unlock policy headroom and social license. The combined evidence points to equity as demand-side infrastructure: invest in capability (advice, intermediaries), affordability (tiered support; on-bill financing), and protection (tenant safeguards), so benefits accumulate where marginal improvements are largest. Well implemented, equity is not a cost add-on; it can leverage pilots into population-level outcomes with important co-benefits like enhanced energy security.[7]

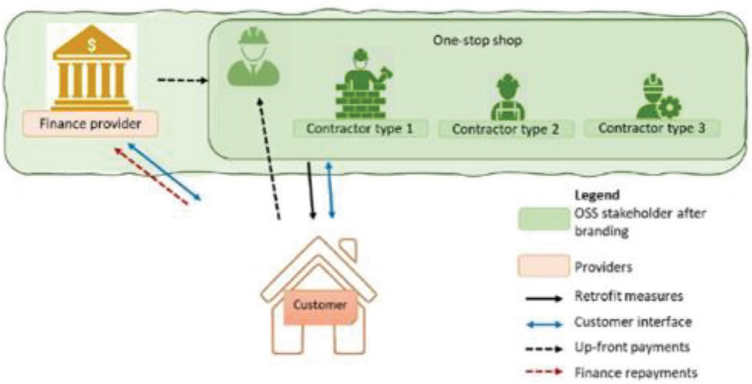

Figure 4.
One-stop shop model of renovation services. Source: Boza-Kiss, 2025.

[7] Bento, N., Grubler, A., Boza-Kiss, B., De Stercke, S., Krey, V., McCollum, D. L., Zimm C., & Alves, T. (2024). Leverage demand-side policies for energy security. Science, 383(6686), 946-949.

Policy Recommendations for Tensions in Sustainability Transitions

Tension	Recommendation	Actors
Trade-Offs (Speed–Scale–Scope)	Orchestrate portfolios that *balance technological innovations (hardware) with the deployment of social innovations (software)* to quickly compound modular interventions and relieve systemic bottlenecks.	Policymakers Coalitions Modellers Private Sector
Resistance (Social Acceptance & Feasibility)	Implement saving measures with visible, *fairly distributed co-benefits and high social acceptance* by pairing voluntary schemes with timely standards, and investing in credible, trustworthy monitoring.	Institutions Policymakers
	Include acceptability constraints and political feasibility envelopes in scenarios.	Modellers
Technological Lock-ins (Rebound & Dependence)	Promote digital interoperability, require privacy-by-design, and audit real-world performance to *ensure efficiency savings persist and do not simply rebound* into higher consumption.	Regulatory Bodies Policymakers Private Sector
Equity (Access, Capability & Impact)	Invest in capability (advice and intermediaries), affordability (tiered support and financing), and protection (tenant safeguards) to ensure *benefits accumulate most where social marginal improvements are largest* and leverage pilots into population-level outcomes.	Policymakers Intermediary Agencies

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