

Global Transformations and the Challenge of Inequality

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Policy Brief

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SHAPING TRANSFORMATIONS TO TACKLE GLOBAL CHALLENGES AND INCREASE EQUALITY

Human activities – including transportation, energy consumption, and the use of harmful goods such as sugar, alcohol, and tobacco – inevitably cause harm. However, this harm is unevenly distributed, disproportionately affecting low-income regions, exacerbating global inequalities. For example, the increasing intake of sugar-sweetened beverages (SSBs) has played a major role in the worldwide rise of Type 2 Diabetes (T2D) and cardiovascular disease (CVD). The most significant impacts are seen in Latin America and the Caribbean, where SSB intake accounts for 24.4% of T2D cases and 11.3% of CVD cases. Sub-Saharan Africa also shows high incidence rates, with SSB intake linked to

21.5% of T2D and 10.5% of CVD cases. In contrast, Southeast and East Asia report the lowest SSB-related T2D incidence, at 3.1% (Lara-Castor et al., 2025). The growing recognition of such inequality, along with broader concerns such as climate change and public health, has driven the establishment of transformative actions, including reduced sugar consumption and the adoption of electric vehicles.

Globally, governments play a crucial role in promoting transformations through policy interventions. These include subsidies for electromobility (e-mobility), the expansion of renewable energy, and incentives for sustainable and health-conscious consumption. By implementing policies, governments actively shape and accelerate systemic change to reduce harm to both people and the environment. How-

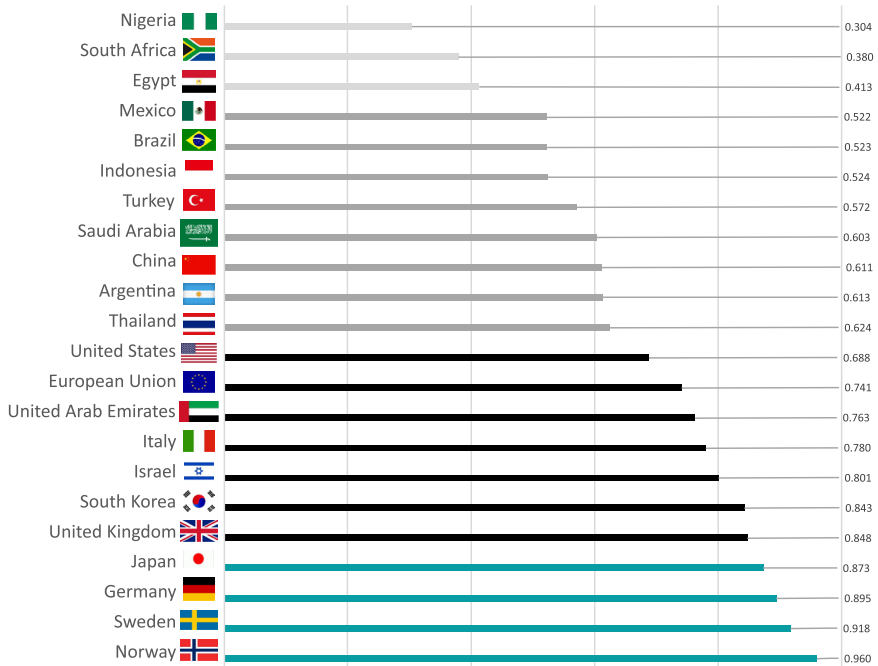


Figure 1: Overall inequality score (own calculations), ranging from zero (unequal) to one (equal).

ever, the extent to which these policies mitigate or exacerbate inequalities largely depends on the policymaking process and the policy outcomes. Only through systematic evaluation can policymakers ensure that policies promote inclusive and equitable transformations.

To conduct such an evaluation, it is necessary to analyze significant ongoing transformation using a well-documented data landscape. The transition to e-mobility provided a fitting case for this study, as it has been underway for several years and has reached an advanced stage. To assess the effectiveness of regulations in accelerating the shift toward battery-electric vehicles (BEVs), we analyzed their im-

pact while considering national inequality indices. Our study expanded on existing research by evaluating the relationship between the policies introduced within the automotive transformation, drawing from a dataset of policies between 2017 and 2024 and on inequality parameters across 22 countries. We calculated an overall inequality index per country by combining economic, political, and social inequality indicators (see Figure 1). Economic inequality was measured using the Gini coefficient and poverty rate; political inequality through civil justice, criminal justice, and human freedom indices; and social inequality through factors such as life expectancy, literacy rate, gender in-

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equality, and climate vulnerability. For the calculation, we used publicly available data sources, such as the Organization for Economic Co-operation and Development (OECD), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the World Bank.

Our findings have supplemented an extensive literature review on the role of inequality within the transformations of e-mobility, public health, and energy. Our analysis aims to identify policy trends, assess current progress, and derive forward-looking insights to help policymakers design equitable transformation strategies. By linking our research to global governance and sustainability debates, we seek to contribute to balancing economic progress with social equity and environmental sustainability.

Transformations as a path towards sustainability and equality are fostered in industries such as automotive, public health, and energy to mitigate environmental harm and enhance societal well-being. Driven by technological innovation and shifts towards sustainability,

these transformations promise benefits, including reduced carbon emissions, improved public health, and more equitable resource distribution. However, while presenting opportunities, these transformations also carry the risk of exacerbating existing inequalities, particularly for marginalized communities. Analyzing these transformations highlights how social and economic disparities can emerge and be reinforced across global, national, and local levels.

The **automotive industry's transition** to e-mobility is widely regarded as a key strategy for decarbonizing transportation and improving air quality. BEVs offer long-term advantages, including lower operational costs and reduced environmental impact, compared to traditional gasoline-powered vehicles (Romero-Lankao et al., 2022). However, the benefits of this shift are not equally accessible to all. Our study suggested that countries differ significantly in their level of BEV adoption depending on their socio-economic characteristics and the extent of their infrastructure investments.

On a global scale, countries with lower inequality tend to invest more in infrastructure, such as charging stations, to ensure widespread participation in the shift to e-mobility. In contrast, economically disadvantaged countries with higher inequality often lack the financial capacity to invest at the necessary scale, leading to insufficient charging networks and inadequate subsidies. This topic regarding policy impacts will be examined in more detail later in this article. This lack of financial support and infrastructure makes enabling the population to participate in the shift to e-mobility significantly more challenging.

Consequently, on a national level, disparities exist between income groups and between urban and rural areas. Cities are generally better equipped with charging infrastructure, while high upfront costs remain a significant barrier for lower-income populations (Romero-Lankao et al., 2022). As Sivak & Schoettle (2018) demonstrated, even in advanced economies such as the US, these financial barriers prevent lower-income groups from benefiting, reinforcing existing inequalities. Similarly, in South Africa, policies have primarily supported higher-income regions, illustrating the challenges of ensuring an inclusive transition (Mashilo & Moothilal, 2021).

However, inequalities in the e-mobility transition extend beyond distribution, also arising in development and production. Countries with higher levels of inequality often invest less in research and development (R&D) for sustainable energy solutions, keeping them dependent on external technological advancements. Moreover, the extraction of key materials for BEV batteries, such as lithium and cobalt, primarily takes place in lower-income countries, where local communities bear the environmental and social costs without receiving proportional benefits (Sovacool et al., 2021). This production-side burden, combined with structural challenges that lead to inequality in innovation capabilities and BEV infrastructure adoption, reinforces global inequalities in both BEV uptake and value-added distribution within the supply chain.

The **public health sector's** shift towards healthier alternatives, such as sugar or cigarette substitutes, aims to mitigate the adverse effects of overconsumption, such as diabetes and cardiovascular diseases.

However, these innovations also reveal a pattern of inequality at international and national levels. For example, while high-income nations are seeing a decline in SSB consumption, beverage companies are increasingly targeting emerging markets, exacerbating health burdens in regions such as Sub-Saharan Africa and Latin America (Lara-Castor et al., 2025). This shift towards western dietary patterns has played a crucial role in deepening health inequalities. The rapid adoption of processed foods and sugary beverages in developing nations without adequate policy intervention has resulted in a significant rise in T2D and CVD between 1990 and 2020 (Lara-Castor et al., 2025).

However, even within individual countries, this public health transformation is not experienced uniformly across socio-economic groups. In the Middle East and North Africa, relatively high SSB-related health burdens are found among people with low education. Lower-in-

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come populations face limited access to healthcare and nutrition education, making them more vulnerable to the adverse health effects of excessive SSB consumption. Surprisingly, in some regions (e.g., Sub-Saharan Africa and Latin America) higher educational attainment has actually been associated with increased SSB consumption. This is because educated individuals in urban areas are more likely to purchase and consume these beverages due to greater exposure to marketing and increased disposable income (Lara-Cas-tor et al., 2025). While education is generally linked to improved health behaviors, this example highlights the importance of specific nutritional knowledge and targeted public health campaigns in effectively preventing negative health impacts.

The **expansion of renewable energy** brings both opportunities and challenges in addressing global inequalities. While renewable energy is essential in combating climate change and new technologies contribute immensely to broader electricity access, the fairness and inclusivity of said access can sometimes be limited. Research by Bianco et al. (2019) suggests that energy policies should place greater emphasis on mitigating inequalities, particularly as industrial expansion in regions with already limited energy access can further constrain availability to households. When energy demands increase but supply is constrained costs rise, making access even more challenging for lower-income households. The development of efficient green technologies during the energy transformation should address challenges and thus increase social equity and environmental sustainability, ensuring affordable energy to reduce consum-

ers' financial burden and foster equitable access to energy resources (Montalbano and Nenci, 2019).

At the national level, researchers have observed that renewable energy projects can also reinforce socio-economic and spatial inequalities. While the transition to solar energy represents a significant shift for many countries, large-scale solar infrastructure projects, such as those in California's deserts or India's Gujarat Solar Park, can intersect with existing social and cultural landscapes, which often hold cultural and ecological significance. In some cases, Indigenous and rural populations experience disruptions – including reduced access to vital resources such as water, which is often redirected for solar panel maintenance, and changes in land use that may not fully consider local needs (Sovacool et al., 2024; Stock, 2021). These examples highlight that achieving a globally shared goal – a more sustainable future that benefits everyone – requires a nuanced approach to ensure equitable access and participation.

Driving these transformations through policy measures is crucial as they play a vital role in tackling major challenges, such as climate change and public health issues, by promoting sustainability, enhancing well-being, and driving technological progress. Ensuring equal access remains a challenge, and careful consideration is needed to minimize potential unintended consequences. Therefore, governments seek to influence transformations by implementing policy measures and incentives that promote desirable behaviors, such as non-smoking or driving BEVs.

Overall, and globally, our study has indicated a general trend towards more

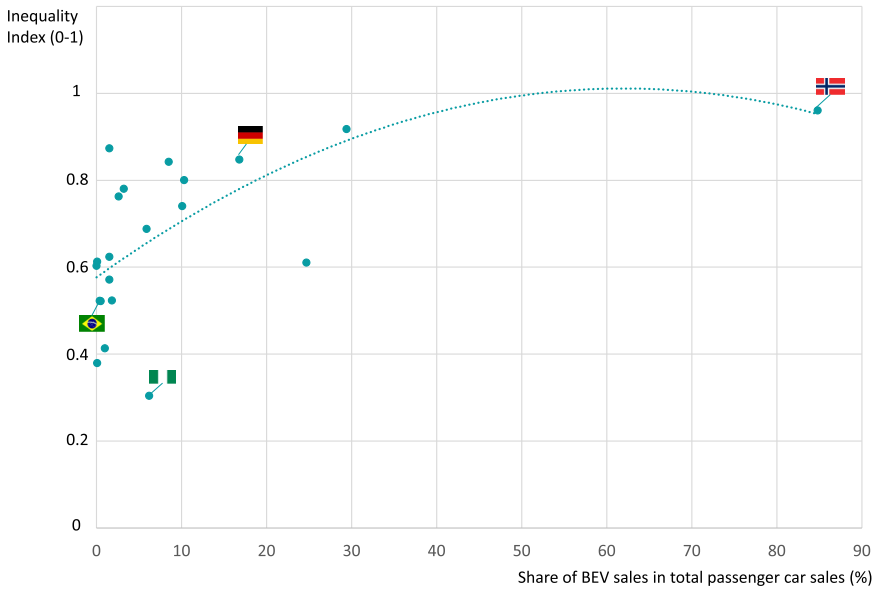


Figure 2: Evaluation of countries based on their inequality index and transformation progress, reflected by share of BEV sales in total passenger vehicle sales in 2024

targeted policies within the dataset. For example, Germany and Sweden invest in battery research and large-scale production, while Thailand supports local BEV manufacturing. The increasing trend of sector-specific regulations reflects governments' strategic efforts to steer transformations effectively.

However, our analysis has clearly shown that the countries in our dataset most commonly opt for shifts in the types of policy instruments, depending on their level of inequality and their transformation stage.

While all countries use framework regulations, those with high levels of equality more often invest in infrastructure development and R&D incentives, reflecting their ability to support long-term structural improvements and innovation. Leading countries, such as Norway, prioritize

accessible charging solutions to solidify their position and encourage further BEV adoption. This suggests that, as nations progress further in the transformation, policy focus shifts towards improving infrastructure and user convenience to create accessibility for the whole population.

Countries with low inequality continue to prioritize infrastructure, but they also opt for introducing purchase subsidies. They are most commonly applied in nations with strong economic and political equality, while countries with the lowest inequality scores tend to rely on them less. This pattern suggests that purchase subsidies may serve as a tool in reducing social and economic inequalities, thereby enabling broader participation in new technologies and innovations. Notably, in 2024, there was a significant increase in direct

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purchase subsidy regulations in countries with high economic equality, indicating a renewed effort to accelerate BEV adoption using policy instruments.

With mid-level inequality, governments shift their focus towards tax incentives, using financial levers to stimulate economic activity. This trend suggests that these nations emphasize economic incentives to encourage widespread participation in the transition to e-mobility. Since inequality is more pronounced, these countries rely more on fiscal measures rather than direct investments. While effective for middle-income consumers, tax incentives are less impactful for lower-income groups, who cannot afford the initial costs of electric vehicles (EVs), even with the promise of future financial benefits.

The countries with high levels of inequality within our dataset focus primarily on R&D incentives, with a strong economic motive, suggesting that, despite high inequality, they attempt to drive innovation. However, their investments differ from those of the countries with the lowest inequality levels, as they strategically use R&D incentives to position themselves as attractive future hubs for the automotive

value chain. Additionally, through these incentives, governments seek to strengthen local production and create opportunities for long-term economic growth and enhanced competitiveness. The lack of substantial infrastructure investments or financial incentives for e-mobility transformation underscores their constrained ability to implement broader economic policies.

In summary, policy priorities differ among countries with different levels of inequality and evolve alongside transformation progress, with leading nations focusing on infrastructure and accessibility. However, financial incentives remain key to shaping equitable access to new technologies (see Figure 2).

Well-designed policies can mitigate inequalities, but their impact depends on inclusivity and enforcement. For example, in the energy sector, policies that involve marginalized communities can promote both social equity and sustainability by ensuring fair participation and benefits. In contrast, health policies targeting SSBs show that, without strong enforcement and broader structural measures, their effectiveness remains limited. The disparity between Latin America, where regulations have had only moderate success, and Sub-Saharan Africa, where weak policy frameworks have exacerbated inequalities, highlights the need for comprehensive, context-specific approaches. Effective policies should not only address immediate challenges but also create long-term inclusive solutions to prevent widening disparities.

Policymakers can adopt several key principles to guide more equitable transformations, such as the following:

- **Context-sensitive Policy Design:**

Policies should account for the varying levels of inequality across different regions, ensuring that infrastructure development, financial incentives, and technological innovations are tailored to the specific needs of disadvantaged communities.

- **Balanced Approach:** Policies should address immediate environmental or health benefits, while also considering broader socio-economic implications. For instance, the rollout of infrastructure or subsidies should not favor wealthier urban areas, but should also reach rural and low-income regions.

- **Holistic Impact Assessments:** Policy-makers should systematically assess the impact of policies, not only in terms of their environmental benefits but also their socio-economic consequences, ensuring that all transformation efforts are equitable and sustainable.

Ultimately, a balanced approach, which accounts for the complexities of inequality, can mitigate the risk of reinforcing disparities, while ensuring a more inclusive and equitable transition to sustainability.

REFERENCES

- Bianco, V., Cascetta, F., Marino, A., & Nardini, S. (2019). Understanding energy consumption and carbon emissions in Europe: A focus on inequality issues. *Energy*, 170, 120–130. <https://doi.org/10.1016/j.energy.2018.12.120>
- Lara-Castor, L., O'Hearn, M., Cudhea, F., Miller, V., Shi, P., Zhang, J., Sharib, J. R., Cash, S. B., Barquera, S., Micha, R., Mozaffarian, D., Global Dietary Database, Trichopoulou, A., Bas, M., Ali, J. H., El-Kour, T., Krishnan, A., Misra, P., Hwalla, N., ... Hakeem, R. (2025). Burdens of type 2 diabetes and cardiovascular disease attributable to sugar-sweetened beverages in 184 countries. *Nature Medicine*, 31(2), 552–564. <https://doi.org/10.1038/s41591-024-03345-4>
- Mashilo, A. M., & Moothilal, R. (2022). Black Economic Empowerment in the automotive manufacturing industry: A case for productive capacity development transformation. *Transformation: Critical Perspectives on Southern Africa*, 109(1), 112–138. <https://doi.org/10.1353/trn.2022.0014>
- Montalbano, P., & Nenci, S. (2019). Energy efficiency, productivity and exporting: Firm-level evidence in Latin America. *Energy Economics*, 79, 97–110. <https://doi.org/10.1016/j.eneco.2018.03.033>
- Romero-Lankao, P., Wilson, A., & Zimny-Schmitt, D. (2022). Inequality and the future of electric mobility in 36 U.S. Cities: An innovative methodology and comparative assessment. *Energy Research & Social Science*, 91, 102760. <https://doi.org/10.1016/j.erss.2022.102760>
- Sivak, M., & Schoettle, B. (2018). *Relative Costs of Driving Electric and Gasoline Vehicles in the Individual U.S. States*. <https://www.semanticscholar.org/paper/Relative-Costs-of-Driving-Electric-and-Gasoline-in-Sivak-Schoettle/53f7e80e181940b980851757e28a56c2aa89c45c>
- Sovacool, B. K., Dunlap, A. A., & Novaković, B. (2025). When Decarbonization Reinforces Colonization: Complex Energy Injustice and Solar Energy Development in the California Desert. *Annals of the American Association of Geographers*, 115(3), 640–670. <https://doi.org/10.1080/24694452.2024.2433040>
- Sovacool, B. K., Turnheim, B., Hook, A., Brock, A., & Martiskainen, M. (2021). Dispossessed by decarbonisation: Reducing vulnerability, injustice, and inequality in the lived experience of low-carbon pathways. *World Development*, 137, 105116. <https://doi.org/10.1016/j.worlddev.2020.105116>
- Stock, R. (2021). Illuminant intersections: Injustice and inequality through electricity and water infrastructures at the Gujarat Solar Park in India. *Energy Research & Social Science*, 82, 102309. <https://doi.org/10.1016/j.erss.2021.102309>

